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**WORK PLAN**
**REMEDIAL INVESTIGATION AND FEASIBILITY STUDY**
**OF ALTERNATIVES**
**LEES LANE LANDFILL SITE**
**LOUISVILLE. KENTUCKY** OCT-84

# PROJECT FOR PERFORMANCE OF REMEDIAL RESPONSE ACTIVITIES AT UNCONTROLLED HAZARDOUS SUBSTANCE FACILITIES—ZONE 1

NUS CORPORATION
SUPERFUND DIVISION

R-586-10-4-38-6

# WORK PLAN
# REMEDIAL INVESTIGATION AND FEASIBILITY STUDY OF ALTERNATIVES
# LEES LANE LANDFILL SITE
# LOUISVILLE, KENTUCKY

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## 1.0 WORK PLAN SUMMARY

This Work Plan has been prepared by the NUS Corporation Field Investigation Team (FIT) for the U.S. Environmental Protection Agency (EPA) in response to EPA Technical Direction Document (TDD) Number F4-8403-17A. The Work Plan has been reviewed and approved by the NUS Corporation Zone Project Management Office, (ZPMO). The TDD directed FIT to prepare a Work Plan for a Remedial Investigation (RI) and Feasibility Study (FS) at the Lees Lane Landfill Site which reflects a reduction in scope (level of effort and cost) from that described in the original Work Assignment (No. 46-4L43, September, 1983) and the first four drafts of the Work Plan prepared by NUS Corporation's Remedial Planning Office, (REMPO), Pittsburgh, Pennsylvania.

The purpose of the Work Plan is to provide:

- A detailed scope of work and technical approach for the RI/FS.
- A detailed work breakdown, schedule, and budget.

The Work Plan as prepared by NUS contains the following sections:

- Work Plan Summary
- Problem Assessment
- Technical Approach
- Management Plan
- Cost and Schedule

### 1.1 Study Design

The overall design of the RI/FS recognizes the National Contingency Plan (NCP) requirements to determine the extent (level) of remedial action necessary while providing a cost-effective study which will produce timely results. Existing site-specific data (described in the Remedial Action Master Plan for the site) and an understanding of the goals and objectives of the Superfund Program were the basis of the study presented in this Work Plan.

Based on the above NCP constraints, some of the RI objectives have been directed toward the determination of the "presence or absence" of contaminants rather than the "nature and extent" of contamination. "Presence or absence" reflects the level of certainty in single-point-in-time-and-space sample collection and analyses. If contaminants are found, it is reasonably certain that contaminants are present (assuming no sample collection or laboratory error). If contaminants are not found, the contaminants could still be present either below the sensitivity of the analytical techniques used or may be present at a slightly different location or at a different point in time. The determination of the "nature and extent" of contamination often requires a more extensive data collection effort over a longer period of time. Where sufficient data are available from past studies or where the area of concern is sufficiently small, a less extensive data collection effort may allow the determination of the boundaries of contamination. But in many cases, the quantity of data necessary to delineate the boundaries of contamination is not warranted until the "presence" of contamination has been established.

## 1.2 Objectives of the Remedial Investigation & Feasibility Study (RI/FS)

The overall objective of this RI/FS is to develop cost-effective remedial alternatives that will eliminate or minimize the uncontrolled release of contaminants from the Lees Lane Landfill Site via air, surface water and groundwater routes, in order to protect the public health and welfare. An evaluation of existing data and known site characteristics has been used to preliminarily identify feasible remedial technologies, prior to final design of the RI. The RI is designed to focus on collecting field data needed to evaluate and conceptualize the feasible remedial technologies.

The following is a list of specific objectives to be accomplished in the RI:

- To locate the approximate boundaries of the fill area.
- To determine the presence or absence of contaminants in the alluvial aquifer in and around the site.

- To more accurately describe the hydrogeology beneath the site to aid in the identification of preliminary remedial technologies.

- To collect air samples and evaluate the effectiveness of the existing gas collection system.

- To collect and analyze samples from obvious or suspected areas of surface contamination at the landfill.

- To evaluate erosion of the Ohio River Bank adjacent to the site and determine the need for bank stabilization.

- To collect and conduct a thorough review of existing data pertaining to the site.

- To identify preliminary remedial technologies appropriate for the site.

The following objectives have been defined for the FS:

- To prepare an Endangerment Assessment which will evaluate the effects of site conditions on public health and the environment.

- To recommend a remedial alternative designed to reduce the threat to public health, welfare, or the environment that will be cost-effective and use acceptable engineering practices.

- To prepare a conceptual design for the selected remedial action, unless the no-action alternative is selected.

## 1.3 Scope of Work

The first activities described in this Work Plan establish the scope of the RI. The information obtained as a result of the RI tasks will be the basis for determination, evaluation, and recommendation of a cost-effective remedial alternative for the

site in the FS. The final activity of the Work Plan is the development of a conceptual design for the selected remedial action unless the no-action alternative is chosen.

Some assumptions were made in the preparation of the Work Plan scope and costs. These assumptions include:

- Based on site conditions during previous studies, respiratory protection (Level B) will be needed during installation of one of the deep monitoring wells only. All other site activities are planned for Level D protection. Use of respiratory protection for planned Level D activities would result in additional costs and revised schedules.

- No estimates are provided for performing laboratory treatability studies. Estimates are provided only for development of a Work Plan to conduct such tests during the FS.

- No estimates are provided for the laboratory analytical costs incurred by the EPA Contract Laboratory Program (CLP), which is currently scheduled to perform all analyses.

- The schedule and cost estimates do not include the additional time necessary to provide the potential responsible parties with split samples.

- Estimated costs and schedules assume only one round of bid solicitations. Additional bid solicitations, if needed, would extend schedules and possibly impact costs.

- EPA will arrange for and coordinate completion of the gas collection system evaluation through EPA Headquarters, Environmental Hazardous Support Division, Emergency Response Branch, Edison, New Jersey. FIT will assist EPA in developing the scope of work and in monitoring

progress of the evaluation. Only those costs associated with FIT's support function in this task are included herein.

- If necessary, EPA will arrange to have the Environmental Photographic Interpretation Center (EPIC) prepare a second topographic map of the Lees Lane Landfill Site. FIT will provide ground control and ground truthing of the map.

The proposed RI/FS has been divided into four project phases, each with specific tasks. The phases and tasks are as follows:

Phase I - Initial Activities

Task 1 - Review of REMPO RI/FS Work Plan
Task 1A - Preparation of Reduced Scope RI/FS Work Plan
Task 2 - Project Management
Task 3 - FIT Community Relations Support Functions
Task 4 - Health, Safety, and General Site Reconnaissance
Task 5 - Existing Data Collection and Evaluation
Task 6 - Site-Specific Health and Safety Requirements
Task 7 - Site-Specific Quality Assurance Requirements
Task 8 - Site Operations Plan
Task 9 - Permits, Rights of Entry, and Other Authorizations
Task 10 - Subcontractor Procurement

Phase II - Remedial Investigation

Task 11 - Field Equipment Mobilization
Task 12 - Ground Surveys
Task 13 - Geophysical Investigation
Task 14 - Groundwater Sampling and Analysis (Existing Wells)
Task 15 - Surface Water and Sediment Sampling and Analysis
Task 16 - Surface Soil Sampling and Analysis

Task 17 - Subsurface Investigation - Drilling
Task 17A - Groundwater Sampling and Analysis (New Wells)
Task 18 - Gas Migration Investigation
Task 19 - Bank Erosion Investigation
Task 20 - Topographic Mapping
Task 21 - Data Reduction and Evaluation
Task 22 - Identification of Preliminary Remedial Technologies
Task 23 - Preparation of RI Report and Revision of FS Work Plan

Phase III - Feasibility Study

Task 24 - Development of Remedial Alternatives
Task 25 - Initial Screening of Alternatives
Task 26 - Laboratory and Field Studies Work Plan Preparation
Task 27 - Remedial Alternatives Evaluation and Preliminary FS Report Preparation
Task 28 - Conceptual Design of Remedial Action
Task 29 - Preparation of Final FS Report

Phase IV - REMPO Technical Assistance

Task 30 - RI/FS Work Plan Preparation
Task 31 - REMPO Status Reporting
Task 32 - REMPO Community Relations Support Functions
Task 33 - REMPO RI/FS Technical Assistance
Task 34 - Endangerment Assessment
Task 35 - Topographic Mapping

All tasks comprising this Scope of Work are described in Section 3.0, Technical Approach.

## 1.4 Manpower Estimates and Costs

The estimated level of effort for each of the phases of the RI/FS is as follows:

- Phase I - Initial Activities: 3,130 man-hours
- Phase II - Remedial Investigation: 4,510 man-hours
- Phase III - Feasibility Study: 2,880 man-hours
- Phase IV - REMPO Support: 3,062 man-hours

These estimates do not include man-hours necessary to conduct treatability studies that may be required for the evaluation of alternatives. Should these studies prove necessary, a detailed Work Plan will be submitted at a later date. The man-hours included in the level of effort estimates are only for the preparation of the treatability study Work Plan.

The man-hours and costs estimated for the Lees Lane Landfill Site RI/FS are presented in Section 5.0. These estimates are based on the EPA Region IV directive that FIT will be performing the RI and the FS. If this directive changes, both the costs and man-hours necessary to perform the scope of work included in the technical approach described in Section 3.0 may change. The estimates were made using assumptions for surveying and drilling subcontract costs that may change with time. The estimated costs presented can be considered valid for 90 days from the date of submittal of this plan.

The total cost for the performance of the RI/FS has been estimated at $558,778 (not including laboratory analytical costs). Higher levels of personnel health and safety protection than those anticipated during the preparation of this Work Plan would result in a substantial increase in the cost of the RI.

## 1.5 Schedule

It is estimated that the Lees Lane Landfill Site RI/FS can be completed within 15 months, following EPA approval of the Work Plan and authorization to begin work.

This schedule, which is presented in detail in Section 5.0, is based on the assumption that EPA will provide interim authorization to begin the Initial Activities prior to Work Plan approval. This interim authorization, as well as immediate action on the part of EPA to secure right of entry, are vital if field activities are to begin 2 weeks after project authorization. Due to the availability of existing data and the relatively short period of performance, individual tasks in the RI will be integrated and overlapped wherever possible.

Completion of the work on schedule is contingent on a 15-day turnaround of analyses of the samples taken from the newly installed monitoring wells, as well as a 90-day turnaround of all other analytical results from laboratories participating in EPA's CLP. This turnaround time includes completion of data validation by EPA's Environmental Service Division (ESD). The schedule also is contingent on securing a qualified drilling subcontractor within a reasonable timeframe. In addition, EPA review time for draft and final reports must be no more than that shown on the schedule to allow for completion of the RI/FS within the designated time period.

## 2.0 PROBLEM ASSESSMENT

Some of the information in this Section was summarized in part from the Lees Lane Landfill Remedial Action Master Plan (RAMP) dated May, 1983 and prepared by NUS Corporation, Remedial Planning Office, Pittsburgh, Pennsylvania. Other references are noted when used.

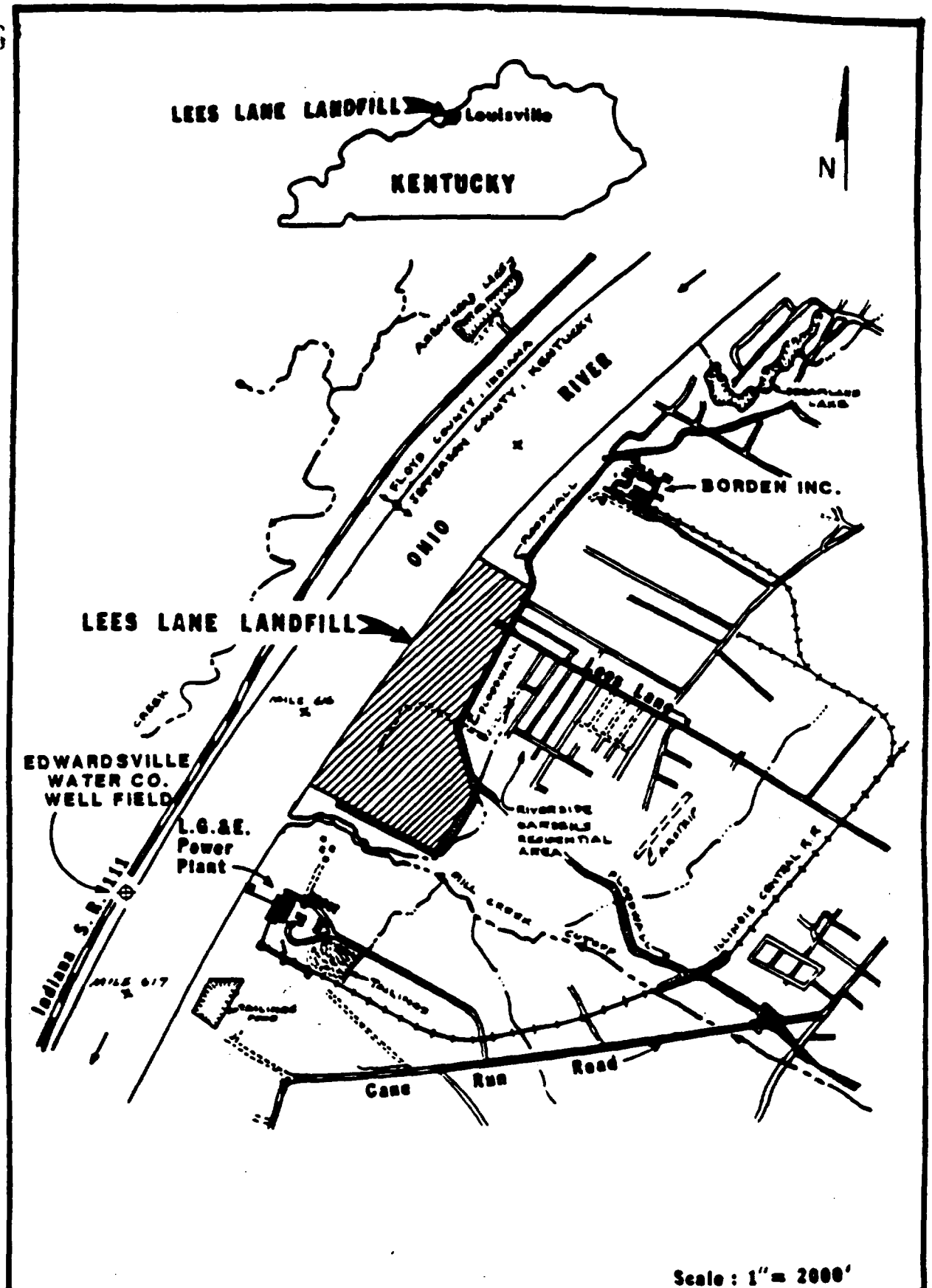
### 2.1 Site History and Description

The Lees Lane Landfill Site, a tract of land of approximately 125 acres, is located along the Ohio River in Jefferson County, Kentucky (Figure 2-1). The landfill is approximately 4.4 miles southwest of Louisville, Kentucky. A location reference point for the landfill is the intersection of Lees Lane and the flood protection levee. This point is located at 38°11'44" N latitude and 85°52'17" W longitude.

The site is bordered on the east and south by the Army Corps of Engineers flood protection levee. Beyond the levee to the northeast is Borden, Inc. (a chemical manufacturer), to the south is Louisville Gas and Electric (a power plant), and to the east is Riverside Gardens (a residential development of about 330 homes and 1100 people). The west side of the site has a narrow, terraced area which serves as a buffer zone between the landfill and the Ohio River.

The site is approximately 5,000 feet in length and averages approximately 1,500 feet in width. The northern and middle portions of the landfill consist of level to gently sloping land. The southern portion is pocketed with excavations with steep slopes. Three terraces, each approximately 20 feet wide, comprise the slope on the river side of the landfill. Steep erosional cuts are common along the southern portion of this slope. Elevations range from 410 feet above mean sea level (msl) along the Ohio River to 463 feet msl along the levee.

The area surrounding the site is predominantly residential and industrial. Approximately 1,470 persons live within a one-mile radius of the site. The current usage of private wells in Riverside Gardens is unknown. Industrial facilities north




SOURCE: ADAPTED FROM LEES LANE EMERGENCY ACTION PLAN ECOLOGY AND ENVIRONMENT, FEBRUARY, 1981.

FIGURE 2-1

**SITE LOCATION MAP**
**LEES LANE LANDFILL SITE**
**LOUISVILLE, KY.**

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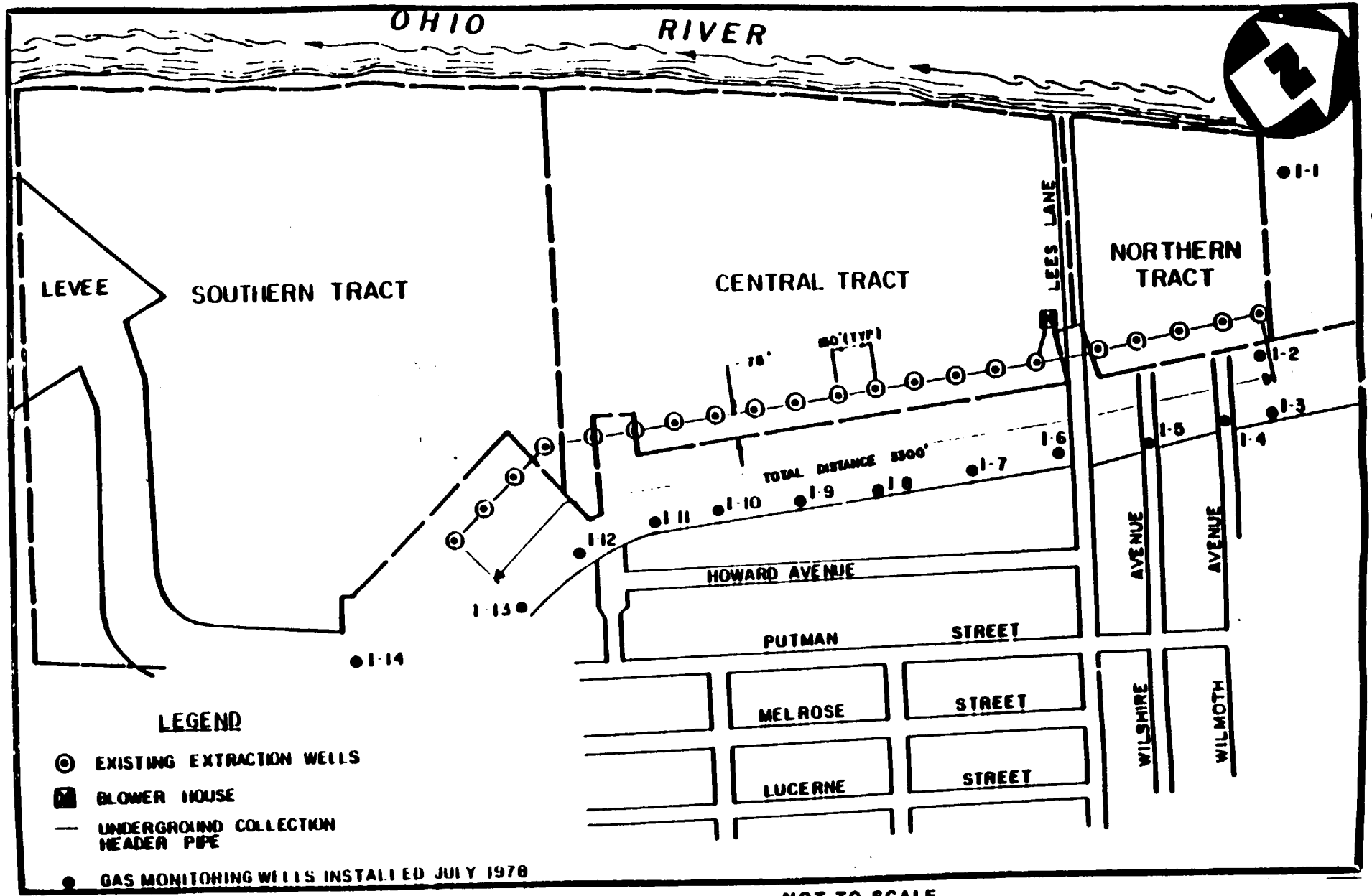
of the site are thought to be using water from the aquifer under the site. Surface waters within a three-mile radius of the site are used only for cooling water and recreation.

Domestic, commercial and industrial wastes were disposed of at the Lees Lane Landfill Site from the early 1940's to 1975. During this time, approximately 212,000 tons of various chemical wastes were buried at the site. Prior to and during its use as a landfill, sand and gravel were quarried at the site by the Hofgesang Company. In 1971 the State permitted the southern tract of the landfill under its Solid Waste Program. In 1974 the Lees Lane Landfill Permit expired and was not renewed due to repeated compliance violations. In April 1975 the landfill was closed.

In March 1975, the Louisville and Jefferson County Departments of Public Health were notified of a gas problem in an area of Riverside Gardens located east of the landfill; flash fires were reported around sink taps and water heaters. The gas was composed primarily of methane and carbon dioxide; however, vinyl chloride and approximately 35 other organic compounds were also found.

From 1975 to 1979, 41 wells were installed in and around the landfill and the residential development to monitor the concentration, pressure and lateral extent of the methane gas migration. In October 1980, a gas venting system, consisting of 21 gas evacuation wells, was installed on the landfill property (see Figure 2-2).

In 1980 the Kentucky Department of Hazardous Materials and Waste Management (KDHMWM) found approximately 400 drums at the site. Many of the drums were in poor condition and were located near the Ohio River bank. The KDHMWM sampled several of the drums in February and March 1980 and found that four of the sampled drums contained materials with flashpoints as low as 85°F. In September and October 1981, in response to a complaint filed by the KDNREP, the landfill owners removed the liquid wastes from the exposed drums for offsite disposal and buried the solid wastes and empty drums onsite.




NOT TO SCALE

**METHANE GAS COLLECTION SYSTEM**
**LEES LANE LANDFILL SITE,**
**LOUISVILLE, KY.**

**FIGURE 2-2**

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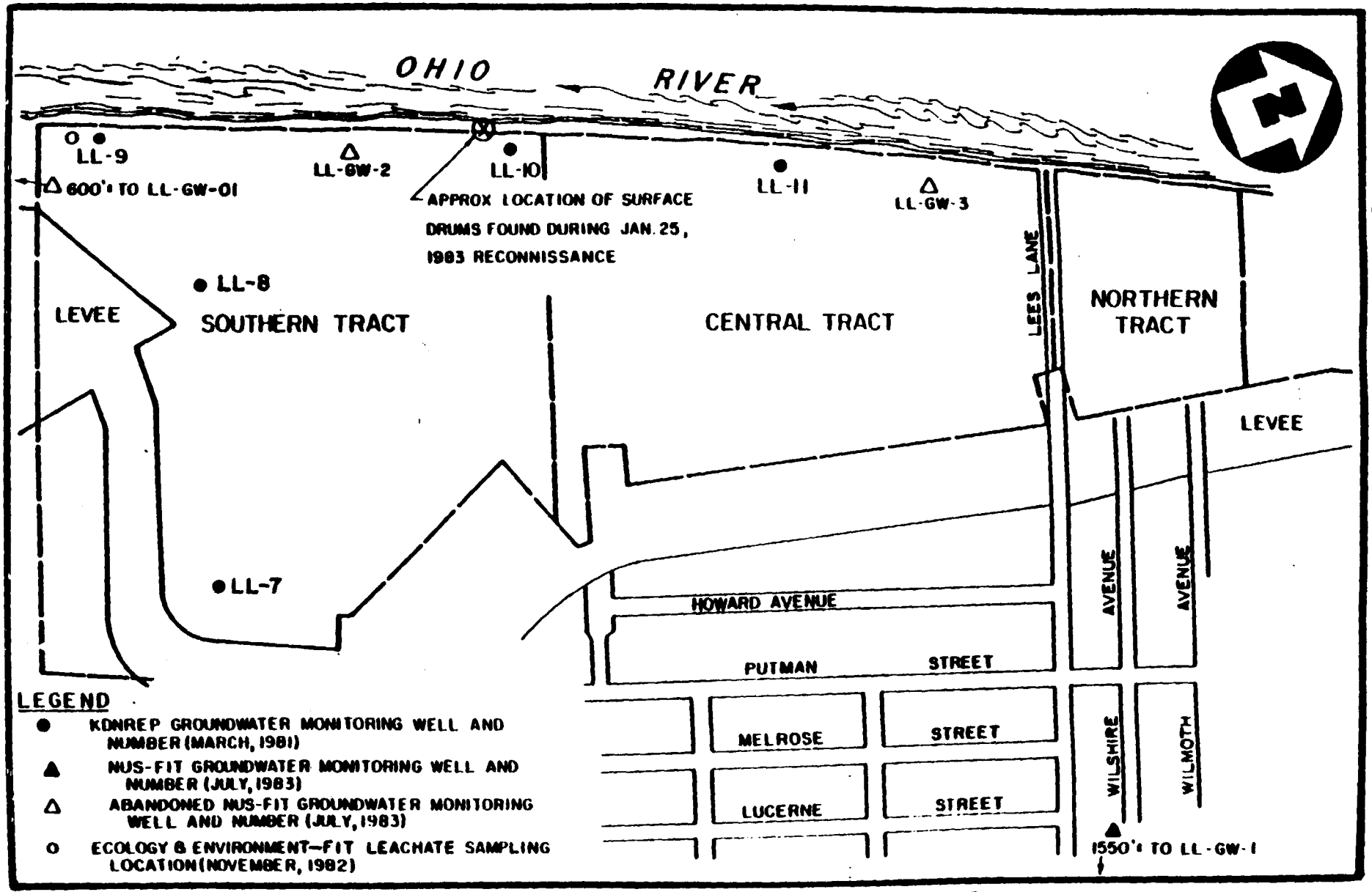
In March 1981 the Kentucky Department of Natural Resources and Environmental Protection (KDNREP) installed five, PVC groundwater monitoring wells at the landfill (Figure 2-3). In April 1981 EPA sampled the wells and found low levels of organic and inorganic contaminants in all of them. Since the slots in the screens of these wells were hand-cut, the samples contained large quantities of sediment. Thus, the analytical results are believed to be elevated.

In November 1982, the Region IV FIT (Ecology & Environment, Inc.) inspected the site and found one leachate outbreak on the southern end of the landfill adjacent to the Ohio River (Figure 2-3). At that time FIT collected a water and sediment sample from the leachate seep.

During a subsequent site visit, in January 1983, FIT (NUS Corporation) discovered approximately 25 drums on the edge of the landfill near the river (Figure 2-3). Later, in April 1983, FIT attempted to install groundwater monitoring wells at the landfill, however, they could not complete this task due to flooding of the Ohio River and the presence of organic and explosive vapors released from the boreholes. A second attempt was made in July 1983, at which time, one upgradient well was installed in Riverside Gardens Park; three boreholes were drilled adjacent to the Ohio River using Level B respiratory protection equipment when needed (see Figure 2-3). Water samples were collected from two of the boreholes and a sediment sample from the third. The middle borehole was terminated before reaching groundwater due to high levels of methane; thus, only one soil sample was obtained. All three of these boreholes were subsequently backfilled with bentonite pellets to inhibit the release of organic and explosive vapors.

## 2.2 Levels of Contamination

Several sampling investigations have been conducted at the site by EPA, the State of Kentucky and EPA contractors. These investigations documented the presence of hazardous substances in the air, soils, and shallow groundwater at the site. The results of several of these investigations are compiled and presented in Lees Lane Landfill RAMP. Those investigations not presented in the RAMP are referenced herein.




**LOCATION OF EXISTING GROUNDWATER MONITORING WELLS AND PAST LEACHATE SAMPLING POINTS LEES LANE LANDFILL SITE, LOUISVILLE, KY.**

NOT TO SCALE

FIGURE 2-3

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These studies indicated that as many as 51 different organic compounds, as well as, a variety of heavy metals, have been detected in samples from the site. A partial list of wastes reportedly disposed of in the landfill include: emulsions, plasticizers, resins, elastomers, insecticides, organics, inorganics, paints, pigments, salts, amides, amines, imides, organic acids, acid solutions, halogenated aliphatics, solvents, oils, oil sludges, esters, alcohols, ketones, aldehydes, asbestos and unknown wastes with flash points below 100°F.

The most recent sampling study was conducted in July, 1983 by NUS Corporation, Region IV FIT. The results of this investigation, which are not included in the RAMP, are presented in a separate report to EPA (1). These boreholes were subsequently backfilled. Tables 2-1 and 2-2 present data from the July, 1983 FIT study, showing the range of compounds and concentrations found in the soil and water samples.

Previous air sampling investigations conducted by EPA and SCS Engineers, the contractor who installed the existing gas collection system at the Lees Lane Landfill Site, have documented that a number of organic compounds, in addition to methane, were present in air samples collected from the site. Table 2-3 presents the results of the previous analyses conducted at the site.

## 2.3 Groundwater

The Lees Lane Landfill Site is underlain by the alluvium of the Ohio River flood plain which is an important source of water in the Louisville area. The alluvium comprises sand and gravel of Pleistocene age with thin deposits of clay and silt. At the site, the thickness of the alluvium is 95 to 100 feet. The alluvium is a permeable water-bearing formation and its entire thickness is considered a single hydrologic unit (2). The thickness of the saturated zone at the site is approximately 60 feet. The saturated zone is known to vary considerably on a seasonal basis and is influenced by flow characteristics of the Ohio River.

Yield of the alluvial aquifer has been estimated at 200 to 500 gallons per minute (2). The hydraulic conductivity of the alluvium is on the order of 134 feet per day

**TABLE 2-1**
**LEES LANE LANDFILL SITE**
**SHALLOW GROUNDWATER SAMPLES**
**ORGANIC AND INORGANIC ANALYSES**
**JULY, 1983**

| ELEMENT/COMPOUND | CONCENTRATION (ug/l) |
|---|---|
| Arsenic | 30(A)-58 |
| Boron | 2700-2800 |
| Barium | 2600-7500 |
| Beryllium | 52-64 |
| Cadmium | 8.3(A)-120(A) |
| Cobalt | 800-860 |
| Chromium | 270-700 |
| Copper | 390-1000 |
| Nickel | 1100-1200 |
| Lead | 970-1300 |
| Selenium | 6.9(A) |
| Vanadium | 540-770 |
| Zinc | 2800-3700 |
| Mercury | 2.7-2.9 |
| Aluminum | 210,000-590,000 |
| Manganese | 22,000-33,000 |
| Iron | 580,000-620,000 |
| Toluene | 34,000 |
| Ethyl Benzene | 23,000 |
| m-xylene | 40,000(B) |
| o & p-xylene (mixed) | 73,000 |
| Arochlor 1260 (PCB) | 15 |

(A) Value is suspect
(B) Estimated value: presumptive evidence of presence of material
These data are taken from "Sampling Investigation Report, Lees Lane Landfill, Louisville, Kentucky", September 6, 1984, FIT TDD # F4-8306-11.
Results shown are for samples collected from locations LL-GW-01 and LL-GW-03, shown in Figure 2-3.

TABLE 2-2
LEES LANE LANDFILL SITE
SOIL/SEDIMENT SAMPLE
ORGANIC AND INORGANIC ANALYSES
JULY, 1983

| Compound | Concentration (ug/kg) | Element | Concentration (ug/kg) |
|---|---|---|---|
| 1,1-Dichloroethene | 9(A) | Arsenic | 3,200(B) |
| 1,1-Dichloroethane | 300 | Boron | 60,000 |
| 1,2-Dichloroethane | 1,900 | Barium | 400,000 |
| Benzene | 220 | Beryllium | 25,000 |
| 1,1,2-Trichloroethane | 170 | Cadmium | 2,000(B) |
| Toluene | 170 | Cobalt | 6,300 |
| Chlorobenzene | 380 | Chromium | 19,000 |
| Ethyl Benzene | 190 | Copper | 50,000 |
| m-Xylene | 300(B) | Nickel | 21,000 |
| o&p Xylene (mixed) | 140 | Lead | 800,000 |
| Acetone | 360 | Antimony | 1,200(B) |
| Methyl Ethyl Ketone | 350 | Tin | 13,000 |
| Methyl Isobutyl Ketone | 520 | Zinc | 490,000 |
| Dichlorocyclobutane | 200(B) | Mercury | 2,400 |
| Dichlorobutene | 2,500(B) | Aluminum | 3,600,000 |
| Hexadecanoic Acid | 50,000(A) | Manganese | 440,000 |
| | | Iron | 10,000,000 |

(A) Estimated value

(B) Estimated value, presumptive evidence of presence of material

These data are taken from "Sampling Investigation Report, Lees Lane Landfill, Louisville, Kentucky", September 6, 1984, FIT TDD # F4-8306-11.

Results shown are for a soil sample collected from location LL-GW-02, shown in Figure 2-3.

Table 2-3

Lees Lane Landfill Site
Well Gas Analyses*

| Compound | U.S. EPA 3/19/75 to 3/30/75 | | | | SCS Engineers 12/1/78 | | | | SCS Engineers 5/3/79 | | | | Composite (all 3 sets) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | Min. | Max. | An[1] | Mean | Min. | Max. | An[1] | Mean | Min. | Max. | An[1] | Mean | Min. | Max. | An[1] |
| Benzene | 15 | 15 | 15 | 1 | 8.8 | 0.1 | 29.5 | 6 | 6.0 | 0 | 45.8 | 8 | 7.7 | 0 | 45.8 | 15 |
| Butane | -- | -- | -- | 0 | -- | -- | -- | 0 | -- | -- | -- | 0 | -- | -- | -- | 0 |
| Butene | 30 | 30 | 30 | 1 | -- | -- | -- | 0 | -- | -- | -- | 0 | 30 | 30 | 30 | 1 |
| Butane/Butene | -- | -- | -- | 0 | 8.6 | 0 | 17.7 | 6 | 0.3 | 0 | 1.8 | 8 | 3.9 | 0 | 17.7 | 14 |
| Chlorobutene | -- | -- | -- | 0 | 3.7 | 0.1 | 14.7 | 6 | 1.4 | 0 | 10.8 | 8 | 2.4 | 0 | 14.7 | 14 |
| Chloroethane | 1 | 1 | 1 | 1 | -- | -- | -- | 0 | -- | -- | -- | 0 | 1 | 1 | 1 | 1 |
| Cyclohexane | 5 | 5 | 5 | 1 | 0 | 0 | 0 | 6 | 3.1 | 5.6 | 19 | 8 | 2.0 | 0 | 19 | 15 |
| Dichlorodifluoro-methane (freon) | -- | -- | -- | 0 | 0 | 0 | 0 | 6 | 10.9 | 0 | 25.7 | 8 | 6.2 | 0 | 25.7 | 14 |
| Dichloroethane | 22.5 | 22.5 | 22.5 | 1 | 9.1 | 0.8 | 22.7 | 6 | 1.9 | 0 | 14.9 | 8 | 6.2 | 0 | 22.7 | 15 |
| Dichloroethene | 40 | 40 | 40 | 1 | -- | -- | -- | 0 | -- | -- | -- | 0 | 40 | 40 | 40 | 1 |
| Dimethylcyclohexane | -- | -- | -- | 0 | 0 | 0 | 0 | 6 | -- | -- | -- | 0 | 0 | 0 | 0 | 6 |
| Ethylbenzene | 27.5 | 27.5 | 27.5 | 1 | 12.0 | 8.6 | 16.6 | 6 | 0.3 | 0 | 2.0 | 8 | 6.2 | 0 | 27.5 | 15 |
| Ethylene | -- | -- | -- | 0 | -- | -- | -- | 0 | 2.2 | 0 | 9.2 | 8 | 2.2 | 0 | 9.2 | 8 |
| Heptane | 15 | 15 | 15 | 1 | 0.03 | 0 | 0.1 | 6 | -- | -- | -- | 0 | 2.2 | 0 | 15 | 8 |
| Heptene | 20 | 20 | 20 | 1 | 0 | 0 | 0 | 6 | -- | -- | -- | 0 | 2.9 | 0 | 20 | 7 |
| Hexane | 15 | 15 | 15 | 1 | 10.3 | 0 | 36.8 | 6 | 1.8 | 0 | 6.7 | 9 | 5.8 | 0 | 36.8 | 16 |
| Isobutane | 10 | 10 | 10 | 1 | 1.8 | 0 | 11.0 | 6 | 1.6 | 0 | 10.8 | 8 | 3.1 | 0 | 11.0 | 15 |
| Methylcyclopentane | 5 | 5 | 5 | 1 | 0 | 0 | 0 | 6 | -- | -- | -- | 0 | 1.0 | 0 | 5 | 7 |
| Toluene | 175 | 175 | 175 | 1 | 12.2 | 0.1 | 23.6 | 6 | 0.8 | 0.7 | 5.7 | 8 | 17.0 | 0.1 | 175 | 5 |
| Vinyl Chloride | 6.7 | 0.0005 | 51 | 20 | 50.5 | 17.4 | 134 | 15 | 37.0 | 0 | 188 | 9 | 27.8 | 0 | 188 | 44 |
| Xylene | 45 | 45 | 45 | 1 | 4.7 | 0 | 10.7 | 6 | -- | -- | -- | 0 | 10.5 | 0 | 45 | 7 |
| 1,3 Butadiene | 3 | 3 | 3 | 1 | -- | -- | -- | 0 | -- | -- | -- | 0 | 3 | 3 | 3 | 1 |

Note: This table was taken directly from the December 1981 E & E Remedial Approach Plan.
(Original source of data = SCS Engineers, 1979)

*All entries in ppm except for no. of analyses

An[1]: Number of Analyses

(3). The general direction of groundwater flow at the site is toward the Ohio River. There is good hydraulic connection between the alluvium and the Ohio River, and hence, a responsive relationship exists between fluctuations in river level and the groundwater level at the site (2). The landward extent of flow reversal at the site is unknown. Further, the water table level and direction of ground-water flow at the site may be influenced by the presence of pumping centers (industries) in the vicinity of the site.

Groundwater quality of the alluvial aquifer is generally considered good, except where localized sources of pollution exist. Relatively high concentrations of nitrate have been noted in groundwater to the east and south of the site, associated with septic tank effluent (4).

Industrial and private drinking water wells in the area are set in the alluvium. At one time, all of the residents of Riverside Gardens subdivision, adjacent to the site, relied on private wells. City water has been extended to the neighborhood, however, it is possible that some of the homes are still being served by private wells. For both the residential and industrial wells, details concerning well depths, construction and current use are unknown.

In the past, samples from private wells in Riverside Gardens have been collected and analyzed for hazardous constituents; however, the results did not conclusively indicate the presence of contamination. These data are summarized in the Lees Lane Landfill Site RAMP.

The alluvial aquifer is separated from a deep carbonate aquifer by a shale aquitard, the New Albany Shale. The shale layer at the site is approximately 100 feet thick (5). The Sellersburg and Jeffersonville Limestones of Devonian Age underlie the New Albany Shale as shown in Figure 2-4. These formations form a single aquifer of secondary importance that yields most of the water pumped from consolidated rocks. Water in this aquifer is contained in and moves along interconnected cracks and solution channels (2). The water in the limestone bedrock is generally very highly mineralized.

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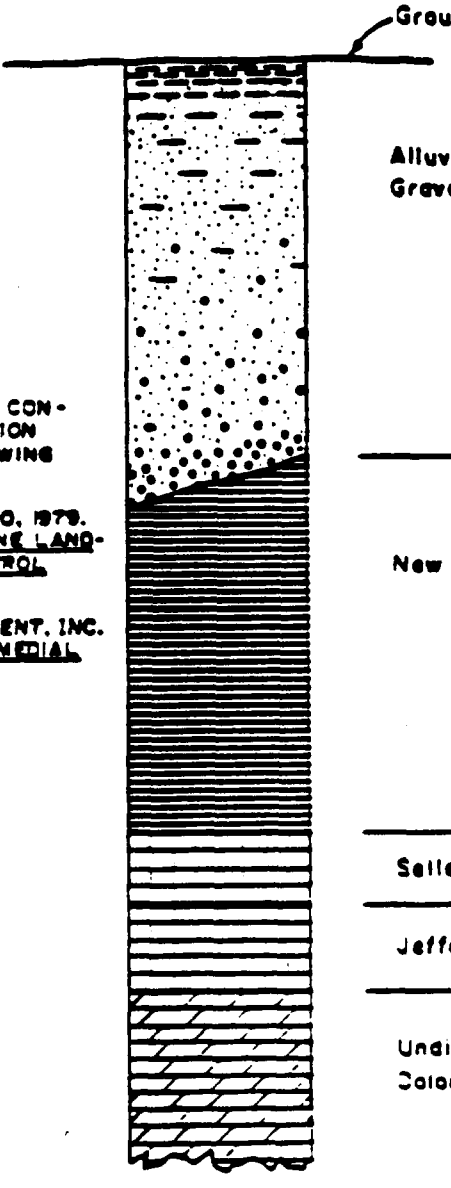


Alluvium: fining upwards from Sand and Gravel to Clayey Silt. 100 ft. ±

New Albany Shale: black, fissile. < 100 ft.

Sellersburg Limestone: 14 ft.

Jeffersonville Limestone: 20 ft.

Undifferentiated Silurian Limestones and Dolomites: > 40 ft.

NOTE: THIS COLUMN WAS CONSTRUCTED FROM INFORMATION CONTAINED IN THE FOLLOWING REFERENCES.

1.) SCS ENGINEERS, JULY 30, 1979. DESIGN REPORT - LEES LANE LANDFILL, METHANE GAS CONTROL SYSTEM.

2.) ECOLOGY AND ENVIRONMENT, INC. DECEMBER 14, 1981. FIT REMEDIAL APPROACH PLAN.

NOT TO SCALE

SOURCE: REMEDIAL ACTION MASTER PLAN
LEES LANE LANDFILL, LOUISVILLE, KENTUCKY
NUS CORPORATION, REMEDIAL PLANNING OFFICE MAY, 1983

FIGURE 2-4

**GENERAL GEOLOGICAL PROFILE FOR THE LEES LANE LANDFILL SITE LOUISVILLE, KY.**

NUS CORPORATION

Although none of the water companies in the Louisville area use groundwater for public supply, there are several public supply wells on the Indiana side of the Ohio River not far downstream from the Lees Lane Landfill Site (see Figure 2-1). The wells, which are 100 feet deep and pump at a rate of 750 gpm, are operated by the Edwardsville Water Company which supplies water to approximately 3000 customers in Indiana. The expected direction of groundwater flow on the Indiana side of the Ohio River is toward the River. A boring for a well installed in the Ohio River adjacent to the site by the USGS in 1945, suggests the Ohio River bed is underlain by about 30 feet of sand and gravel above the shale bedrock. Due to the presence of this sand and gravel layer, groundwater passing through and under the Lees Lane Landfill Site may be traveling laterally beneath the River toward these supply wells.

## 2.4 Surface Water

The Lees Lane Landfill Site is located in the Ohio River Drainage Basin on the Kentucky shoreline between river mile 615 and 616. The Ohio River Drainage Basin is one of the major drainage basins within the United States and its streams are a major source of public drinking water. The normal pool elevation is 383.0 feet msl, low pool elevation is 374.0 feet msl and flood stage is 428.2 feet msl. At flood stage, the River inundates the entire river bank of the landfill. Flood stage is reached on the average every 1.2 years. The designated 10-year flood level is 436.0 feet msl; a level which would inundate a majority of the landfill (6).

Water quality in the Ohio River is impacted by numerous point and non-point source discharges throughout the drainage basin. Federal water quality criteria for coliform bacteria, dissolved oxygen, phenols, cyanide, manganese, lead and zinc are frequently exceeded (4). Due to the good hydraulic connection between the alluvium and the River, leachate and/or contaminated groundwater from the landfill may contribute to the pollutant load on the river; however, the high flow rates and large water volume of the river may substantially mitigate any impacts.

A number of deteriorated drums of unknown wastes and other debris are present on the upper terraces of the river bank and would be subject to scouring at flood

stage. Similarly, erosion of contaminated soils, if present, may contribute to offsite contamination.

There is a swampy area in the southeast section of the landfill that probably receives runoff and possibly leachate from nearby areas of the landfill. Several wet areas show up on aerial photos of the site as far back as 1959. Surface runoff from the site into the Ohio River has created deep erosional cuts in the river bank, primarily on the southern end of the site. Historically, a large portion of the surface runoff drained to the south into Mill Creek; however, construction of the flood protection levee has altered the pathway of surface flow. Mill Creek flows through the levee, just before it discharges to the Ohio River.

In addition, there are a number of ponds of standing liquid around the site that are devoid of vegetation. Sediments associated with these ponded areas may be contaminated as well.

## 2.5 Soils

The natural soils at the site consisted of fine, sandy loam to silty loam of the Wheeling-Weinbach-Huntington soil association, overlying the sand and gravel of the alluvium. The soils were moderately to well-drained on a level to sloping topography (7). Excavation and landfill operations at the site disrupted and replaced natural soil associations. Reportedly, wastes deposited at the site were ultimately covered with natural soil material.

The surface of the landfill is currently stabilized, to some extent, by grasses and other terrestrial vegetation. A few areas do not support the growth of vegetation possibly due to presence of contaminated soils. Several areas on the site were used in the past for drum storage and staging; spillage and leakage may have occurred. Furthermore, surface disposal of wastes cannot be discounted.

To date, no surface soil samples from the landfill have been analyzed to document the presence of contaminants.

## 2.6 Air

Over the past 10 years much data have been collected to verify the presence of explosive concentrations of methane gas at the landfill and in Riverside Gardens. In addition to methane and carbon dioxide, vinyl chloride and approximately 35 other organic compounds have been detected. A partial list of these organic compounds is presented in Table 2-3.

The existing gas collection system may be an appropriate and effective means of collecting and dispersing the methane gas produced by decomposition processes within the landfill; however, it may not be an acceptable method of dealing with carcinogenic and teratogenic organic vapors that are transported along with the methane gas.

## 2.7 Proposed Response

The conditions at the Lees Lane Landfill Site are such that traditional remedial measures for landfills may not be appropriate. The existence of dense vegetation and deeply rooted trees may preclude the use of surface sealing and/or capping and the proximity of the site to the Ohio River may impede the application of remedial measures between the fill and the River. The size of the site (125 acres) may render removal and the attendant transportation of wastes through the nearby neighborhood unacceptable. In addition, past occurrences of flash fires in Riverside Gardens and the current presence of odors on the landfill present potential public health concerns. Therefore, the RI has been designed to carefully address routes of exposure.

Past studies at the landfill have documented the presence of hazardous substances in the air, groundwater, and subsurface soils. Surface water and soils/sediments may have become contaminated through surface activities such as drum staging or spillage/leakage; through leachate seepage; or through gas migration. However, surface soils/sediments are not expected to be as contaminated as the subsurface soils and materials in the fill proper; the main concern with these media will be direct contact.

An investigation to determine the levels of air contaminants at the site and in the nearby neighborhood will be conducted under a separate contract administered by EPA and coordinated by FIT. The existing gas collection system will be evaluated for present and future use. The product of the investigation will be the identification of the need for upgrading or modifying the existing system and/or the need for long-term monitoring at the site or in Riverside Gardens.

An equally significant concern is the migration of leachate into groundwater beneath the site. Groundwater flow at the Lees Lane Landfill Site is primarily toward the Ohio River. The presence of 30 feet of sand and gravel between the Ohio River bed and the shale bedrock below, and the Edwardsville Water Company well field withdrawal of groundwater on the Indiana side of the Ohio River may provide the potential for groundwater flow beneath the Ohio River. In addition, pumping centers in the vicinity of the site and high water levels in the Ohio River may contribute to temporary flow reversals. The RI has been designed to investigate each of these potential flow paths. See Figures 2-5 and 2-6 for the proposed sampling locations.

Groundwater discharge to the Ohio River will be investigated through the collection of leachate samples between the landfill and the River, and the collection of near-shore surface water samples. The analyses of these samples will be compared to investigate the impact of leachate on River water quality. Three Ohio River samples will be collected. One sample will be collected upgradient of the site to establish upstream water quality characteristics; one adjacent to the site and one downstream of the site will be collected to determine if contaminants found in the leachate are also present in increased levels in the Ohio River in the vicinity of the site. Existing shallow monitoring wells at the site near the river side of the landfill will be sampled and one upgradient shallow monitoring well will be installed and sampled. Analyses of samples from these wells will be used to investigate potential changes in groundwater quality as it passes through the fill.

Two monitoring wells (one upgradient in Riverside Gardens and one on the river side of the fill) will be installed at the top of the shale bedrock. See Figure 2-5 for the proposed monitoring well locations. The downgradient well (in the fill) will be

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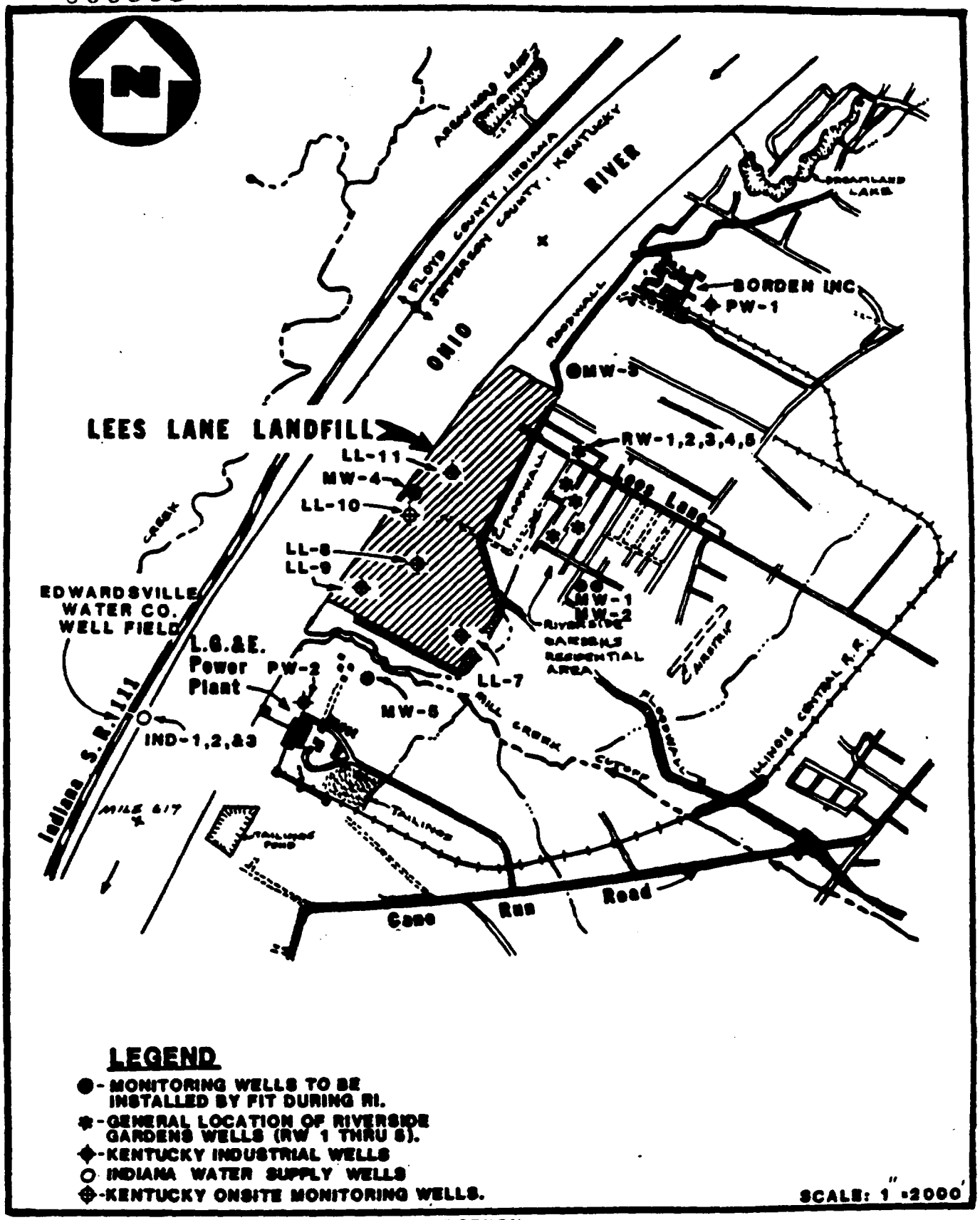
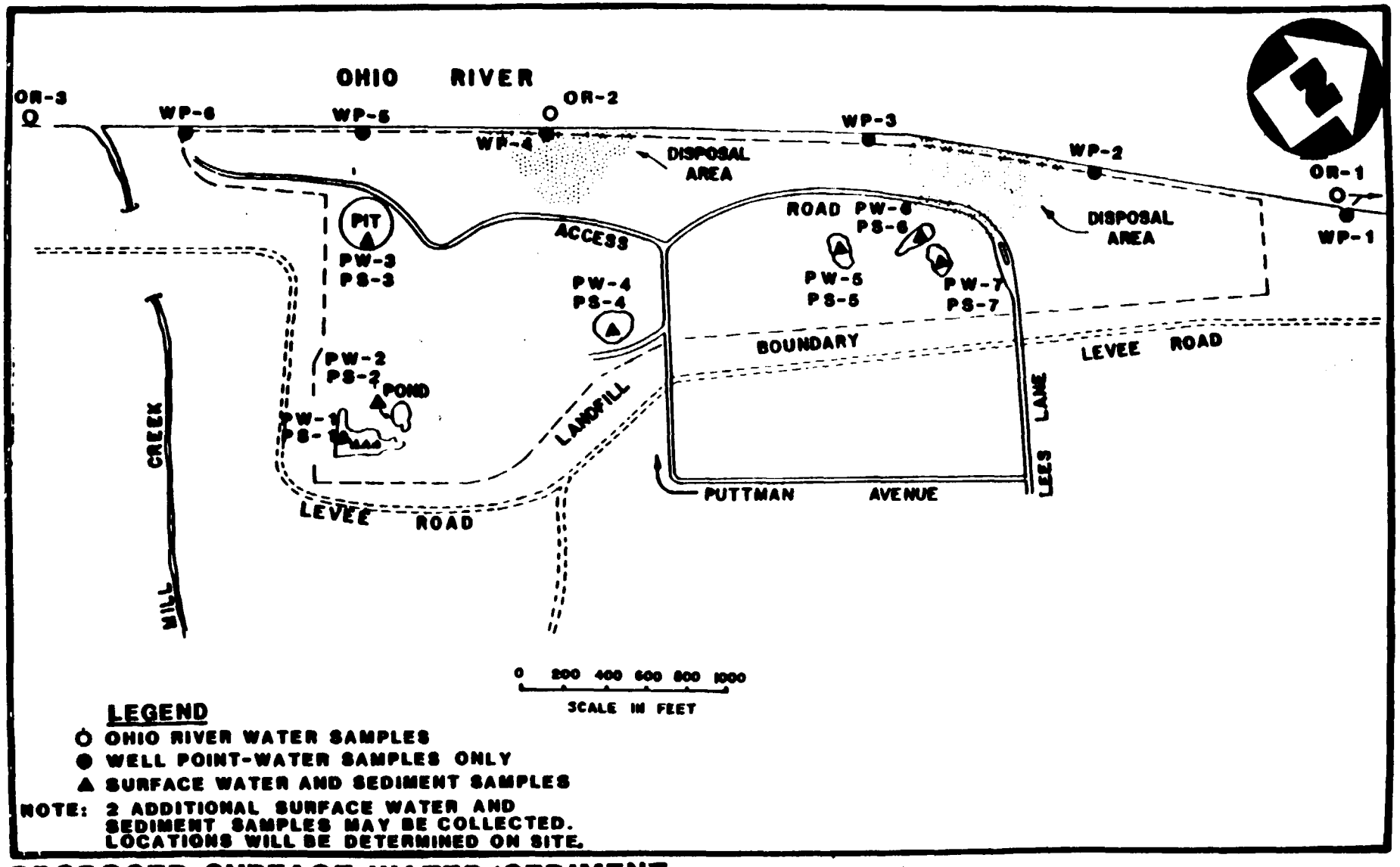



BASE MAP ADAPTED FROM LEES LANE EMERGENCY ACTION PLAN, ECOLOGY AND ENVIRONMENT, FEBRUARY, 1981.

FIGURE 2-5

**PROPOSED LOCATIONS OF WELLS TO BE SAMPLED LEES LANE LANDFILL SITE LOUISVILLE, KENTUCKY.**

NUS CORPORATION
A Halliburton Company




**PROPOSED SURFACE WATER/SEDIMENT AND WELL POINT LOCATIONS LEES LANE LANDFILL SITE LOUISVILLE, KY.**

**FIGURE 2-6**

NUS CORPORATION
A Halliburton Company

equipped with a continuous water level recorder to evaluate the effect of the Ohio River on the water table aquifer. The deep upgradient well, the well on the river side of the fill and two Edwardsville Water Company public water supply wells will be sampled to evaluate the potential for groundwater flow beneath the Ohio River.

The potential for flow reversal will be examined through the installation of two monitoring wells installed at the top of the shale bedrock, each with a 35-foot section of screen, between the site and Borden, Inc. and between the site and power plant. The well between the site and Borden, Inc. will be equipped with a continuous water level recorder to measure the effects of pumping on groundwater flow at the site. Residential wells near the site boundary, industrial wells, and the newly installed monitoring wells will all be sampled. The analyses of these samples will be compared to known downgradient analyses to investigate the potential water quality effects of flow reversal.

Water levels measured in the four newly installed monitoring wells set on the top of the shale bedrock will be used to construct a water table contour map of the conditions encountered during sampling. The water level measurement in the shallow and deep upgradient wells will be compared to estimate the vertical component of groundwater flow in the vicinity of the site.

Surface contamination problems at the site are expected to be limited to small areas of ponded surface water, an onsite swamp, and isolated areas of contaminated soils. Since the landfill is not secured and public contact is possible, these areas of potential contamination will be sampled. Selection of the sampling points will be based on review of historical photos and visual observation during the initial site reconnaissance.

# 3.0 TECHNICAL APPROACH

## 3.1 Introduction

Section 3.0 presents the technical approach to be implemented for the Initial Activities, RI, and FS for the Lees Lane Landfill Site, described in Sections 3.2, 3.3, and 3.4, respectively, of this Work Plan. This Section also presents the activities comprising REMPO Technical Assistance, Phase IV.

Initial Activities at the Lees Lane Landfill Site will include collection and assessment of pertinent site data and preparation of site operational plans, etc., which are necessary prior to commencement of the RI activities and FS tasks. The Initial Activities are described in Section 3.2.

The RI will include those activities necessary to meet the study objective described in Section 1.2. The RI will produce data of adequate technical quality for evaluation of remedial alternatives during the FS. The RI is described in Section 3.3.

The FS will identify and evaluate appropriate remedial actions for the site, based on existing data and information gathered during the RI. A cost-effective remedial alternative will be recommended. A conceptual design will be prepared for the selected remedial action. Section 3.4 describes the FS.

REMPO Technical Assistance will include technical assistance on an as needed basis, the primary support for any RI/FS community relations activities, and preparation of the Endangerment Assessment. The REMPO Technical Assistance activities are described in Section 3.5.

## 3.2 Initial Activities (Phase I)

A total of 10 tasks have been identified as Initial Activities. These tasks have been separated from those of the other phases for scheduling purposes only.

**Task 1 - Review of REMPO RI/FS Work Plan**

The first drafts of the Lees Lane Landfill Site RI/FS Work Plan were prepared by REMPO under Work Assignment No. 46-4L43. FIT reviewed and made recommendations for revision of the draft based on their past field experience and knowledge of site characteristics. FIT's comments were incorporated into the 4th draft of the Work Plan prior to its submission to EPA for review. All work on this task has been completed.

**Task 1A - Preparation of Reduced Scope RI/FS Work Plan**

This Work Plan for the Lees Lane Landfill Site has been prepared by Region IV FIT. The Work Plan serves as the general framework for execution of the various tasks planned within the RI/FS. This document specifies the deliverables of each task, provides a schedule for implementing the tasks within each major phase of activity, and presents an estimate of overall project costs.

**Task 2 - Project Management**

The RI/FS will be administered by a FIT Project Manager assigned to the project. The Project Manager will be responsible for ensuring the technical quality of the project, controlling costs and the work schedule, implementing appropriate Quality Assurance procedures during all phases of activity, reviewing all technical reports, and coordinating between FIT and EPA, and FIT and ZPMO.

Project management personnel will be responsible for coordinating the tasks as outlined in the detailed management plan and for interacting with the EPA Remedial Project Manager (RPM).

The Project Manager will lead the daily activities of the RI/FS, providing technical direction to each phase of the project. Regular interface and periodic status reports regarding project completion and the schedule will be submitted to the ZPMO.

**Task 3 - FIT Community Relations Support Functions**

Community relations support provided by FIT will be at the request of EPA and REMPO, and may include logistical support for the planning and execution of the activities at the Lees Lane Landfill Site and technical support to ensure that all information is accurate and current. Due to the nature of public involvement, community relations input must be flexible to accommodate fluctuations in public interest and with technical progress at the site. FIT will, at the request of EPA, assist EPA in presenting the findings of the RI/FS to the public. REMPO will provide the majority of the community relations support activities under Phase IV, and FIT will provide only secondary support under this task.

**Task 4 - Health, Safety, and General Site Reconnaissance**

The site reconnaissance will be conducted to evaluate the current site conditions and to locate sampling points. Several activities have been identified for the site reconnaissance:

- Performing a health and safety reconnaissance.
- Locating physical hazards and features.
- Performing a geologic and hydrologic field reconnaissance.
- Evaluating site conditions for preliminary locations of surface water, sediment, and soil sampling points and monitor wells.
- Inspecting the onsite State monitoring wells.

A site meeting with EPA and State personnel will be used to exchange site data, to review the objectives of the remedial actions, and to review pertinent site hazards and conditions.

FIT will conduct a reconnaissance to assess health and safety hazards. Previous drilling operations onsite have required the use of Level B respiratory protection due to high levels of methane and other organic vapors. FIT will conduct health and safety air monitoring around the site and a standard scan for radiation.

The team will locate physical hazards and features on a map of the site and will document the features photographically. The site, nearby terrain, and surface waters will be inspected visually for contamination, including signs of soil, or water pollution, vegetative stress, and effects on wildlife.

This reconnaissance will also identify preliminary sample locations and an area suitable for setting up the field office.

**Task 5 - Existing Data Collection and Evaluation**

FIT will attempt to obtain pertinent site-specific data available on the Lees Lane Landfill Site previously collected by EPA and other federal agencies; state agencies, and EPA contractors. Potential data sources include, but are not limited to, the following:

- Edwardsville Water Company
- Borden, Inc.
- Louisville Gas and Electric
- Corps of Engineers (COE) District Office in Louisville
- Ohio River Sanitation Commission (ORSANCO)
- Housing and Urban Development/Corps of Engineers (HUD/COE) (Flood plain maps)
- Kentucky Department of Hazardous Materials and Waste Management
- Kentucky Department of Natural Resources and Environmental Protection
- U.S. Geological Survey
- Kentucky Geological Survey

Some of the major activities of this task include the following:

- Evaluating previous studies at the site to identify up to five homes in Riverside Gardens having private wells which could be sampled. For those wells selected, information including well depth, well

construction, depth to the water table and drillers logs will be compiled, if available

- Compiling information on groundwater usage by the bordering industrial facilities and by the water company across the Ohio River from the site, in Indiana. This information will include pumping rates, historical water quality data, well construction, and geological data

- Obtaining historical and current hydrologic data on the Ohio River from the COE and water quality data from ORSANCO and state agencies

- Assembling a representative list of the types and quantities of hazardous wastes disposed of onsite, based on available information in the Eckhardt Survey Report

- Evaluating historical aerial photos to better define operational practices at the landfill and the landfill boundaries

- Identifying upstream industrial discharges to the Ohio River using State National Pollution Discharge Elimination System (NPDES) files

- Delineating the 100 and 500 year flood plains as shown by the HUD (COE) Flood Plain Maps

Pertinent data collected under this task will be compiled and presented in the RI report.

**Task 6 - Site-Specific Health and Safety Requirements**

Site-specific health and safety requirements will be identified for the Lees Lane Landfill Site. The requirements will be based on guidelines in the current revision of the NUS Superfund Division Health and Safety Manual. The purpose of the requirements will be to:

- Provide safety protection and procedures for site field crews and subcontractors
- Ensure adequate training and equipment to perform expected tasks
- Provide ongoing site monitoring to verify preliminary safety requirements and revise specific protection levels as required
- Protect the general public

The level of protection required for personnel working onsite during a majority of the RI is anticipated to be Level D since previous surface sampling investigations at the site have been conducted using Level D protection. However, a previous attempt by FIT to install monitoring wells on the river-side of the site required the use of Level B protection due to the high levels of organic vapors in the boreholes. For this reason, it is planned that installation of the monitoring well located in the landfill next to the River will require the use of Level B respiratory protection by both FIT personnel and the drillers. FIT will be responsible for training the drillers in the use of respiratory equipment.

FIT will monitor for explosive and organic vapors continuously during drilling using an oxygen meter, explosimeter, HNU and/or an organic vapor analyzer. Specific health and safety requirements concerning site activities requiring Level B and Level D protection will be presented in a detailed Health and Safety Plan to be developed under this task.

At the present time it is anticipated that members of EPA's Emergency Response Team, Edison, New Jersey, will collect and analyze three air samples from the site prior to FIT's site reconnaissance. The results of these analyses will be considered in development of the final site-specific health and safety requirements. Health and safety requirements established during execution of the Initial Activities will be subject to revision and refinement throughout the RI as additional site-specific data are collected.

**Task 7 - Site-Specific Quality Assurance Requirements**

Quality assurance requirements will be identified for the Lees Lane Landfill Site RI/FS based upon the current revision of the NUS Superfund Division Quality Assurance Manual. The requirements for the RI will refer to or include site-specific details on sampling; field testing; surveying; chain-of-custody; sample handling, packaging, preservation, and shipping; and recordkeeping and documentation. All sample collection, sample preservation, and chain-of-custody procedures used during this investigation will be in accordance with the standard operating procedures as specified in the Water Surveillance Branch Standard Operating Procedures and Quality Assurance Manual (Draft), United States Environmental Protection Agency, Region IV, Environmental Services Division, August 29, 1980 as revised by the December 14, 1983 letter from the NUS Region IV Sampling Section Leader to the NUS Manager of Quality Assurance and Security. All laboratory analyses and quality assurance procedures used during this investigation will be in accordance with standard operating procedures and protocols as specified in the Analytical Support Branch Operations and Quality Assurance Manual, United States Environmental Protection Agency, Region IV, Environmental Services Division, April, 1982 or as specified by the existing EPA standard procedures and protocols for the contract analytical laboratory program. The quality assurance requirements necessary for the FS will also be developed based on the current revision of the NUS Superfund Division Quality Assurance Manual. Key elements of the water quality assurance requirements established during this task will be included in the Site Operations Plan.

**Task 8 - Site Operations Plan**

A Site Operations Plan which outlines and coordinates all field activities at the site will be developed. The plan will serve as a detailed guide for all activities to be conducted at the site. The plan will include the Quality Assurance and Health and Safety Requirements developed in Tasks 6 and 7 and will include procedures for sampling various media expected to be found both onsite and offsite. Decontamination and waste handling procedures will be established. Levels of personnel protection will be outlined in detail.

Sampling locations will be established for the soil, surface water, groundwater, and sediment samples to be collected during the RI. The sampling locations will be based on site data obtained during the field reconnaissance and from detailed review of existing reference sources. Details of the geophysical survey and installation of all monitoring wells will also be provided.

**Task 9 - Permits, Rights of Entry, and Other Authorization Requirements**

All permits necessary for the RI activities will be identified. The subcontractor will be responsible for obtaining any required drilling permits. FIT has developed a form which requests permission to sample private water supplies. Development of the form was coordinated with and approved by EPA before distribution to private citizens. EPA will be responsible for obtaining permission from the landfill owner(s) to conduct all onsite activities and for obtaining permission from the appropriate landowners to construct monitoring wells on their property. Field activities can not be initiated until appropriate site access has been authorized by EPA. Therefore, if site access has not been secured at the time that authorization is granted by EPA to begin work, the field activities may not be conducted within the schedule presented.

**Task 10 - Subcontractor Procurement**

NUS, as the Zone I contractor, anticipates subcontracting all of the drilling and monitoring well installation, and a property boundary survey. The bid specifications will be prepared after approval has been secured from EPA. Once the bid and specification documents are prepared, the subcontractors will be obtained using the procedures specified in the NUS procurement procedures.

The process of advertising for and evaluating bids will begin upon receipt of EPA authorization. Contract award will not be made until concurrence has been obtained from the EPA Contracting Officer regarding the subcontractor selected by NUS.

EPA will be responsible for arranging for preparation of a new topographic map of

the site, if necessary, through the Environmental Photographic Interpretation Center (EPIC). FIT will assist EPA in coordinating with EPIC, perform ground truthing and provide for ground control. EPA will also take the lead in coordinating the evaluation of the existing gas collection system through EPA's Hazardous Response Support Division, Environmental Response Branch (ERB), Edison, New Jersey. FIT will assist EPA in preparation of the scope of work for the evaluation and will coordinate execution of the evaluation.

## 3.3 Remedial Investigation (Phase II)

The purpose of the RI is to collect current site-specific data, leading to identification of onsite contamination and an assessment of the potential for offsite migration of contaminants. A total of 13 tasks have been identified for this purpose and are described herein.

The sampling activities performed under Phase II will involve collection and analysis of up to 70 samples, excluding blanks, spikes and duplicates. All samples will be analyzed for extractable organic compounds; pesticides and PCB's; purgeable organic compounds; and metals; including mercury and cyanide. In addition, all groundwater samples will be analyzed for carbonate, bicarbonate, sulfates and chlorides.

As summarized in Section 2.0, past studies have found a variety of contaminants and, in order to evaluate current site conditions, all of these analyses will be required. Table 3-1 summarizes the number of samples and analyses required for the Phase II activities.

### Task 11 - Field Equipment Mobilization

This task includes the labor and costs for acquisition of general field equipment and supplies required for the RI. This task also covers procurement of the field office and its placement into full operation, including the necessary utilities hook-up and procurement of a security guard to protect field equipment left onsite nights and weekends when FIT personnel are not present.

**Table 3-1**
**Summary of Samples and Analyses Required for**
**the Remedial Investigation at**
**The Lees Lane Landfill Site**

| Task | Medium | Extractable Organics | Pesticides & PCB's | Purgeable Organics | Metals | Cyanide | SAS[1] |
|---|---|---|---|---|---|---|---|
| 14 | groundwater[2] | 18 | 18 | 18 | 18 | 18 | 18 |
| 15 | surface water | 12 | 12 | 12 | 12 | 12 | |
| | sediment | 9 | 9 | 9 | 9 | 9 | |
| | leachate | 6 | 6 | 6 | 6 | 6 | |
| 16 | surface soil | 12 | 12 | 12 | 12 | 12 | |
| 17 | mud/gravel[3] | 4 | 4 | 4 | 4 | 4 | 4 |
| | water[3] | 4 | 4 | 4 | 4 | 4 | 4 |
| 17A | groundwater[2] | 5 | 5 | 5 | 5 | 5 | 5 |
| | Subtotal, soil analyses | 25 | 25 | 25 | 25 | 25 | 4 |
| | Subtotal, water analyses | 45 | 45 | 45 | 45 | 45 | 27 |
| Total Analytical Requirements | | 70 | 70 | 70 | 70 | 70 | 31 |

(1) These samples will also be analyzed for carbonate, bicarbonate, sulfates and chloride.

(2) All five samples from Task 17A and up to three samples from the Edwardsville Water Company under Task 14 are planned for quick turnaround analysis.

(3) These samples are required to provide quality control of water, drilling mud and gravel pack used during monitoring well installation.

**Task 12 - Ground Surveys**

A legal description of the property boundaries will be obtained and located on the topographic map, under a subcontract, by a land surveyor registered in the State of Kentucky. The property boundary survey is required to ensure that the RI activities and remedial actions will not infringe on neighboring properties without obtaining appropriate permission. Further, the property boundary must be delineated in the event that fencing is selected as a remedial action.

Following installation of the groundwater monitoring wells, FIT will reference the wells horizontally and vertically to the nearest permanent benchmark as identified through the property boundary survey. Accurate elevations of the wells are needed for interpretation of geologic and hydrologic data collected from the wells during installation and monitoring. The wells will be located on the topographic map of the site.

Measuring point elevations, referenced to mean sea level, will also be surveyed for all wells in which a water level is taken so that an accurate groundwater contour map can be constructed.

**Task 13 - Geophysical Investigation**

Geophysical techniques will be used at the site for approximating the fill boundaries and to aid in locating the new FIT monitoring wells. Determination of the landfill boundaries combined with information on depth of fill from Task 17 will provide the data needed to estimate the volume of landfill. These data will be used during the FS to evaluate excavation and disposal as a remedial alternative.

The landfill boundaries will be approximated based on historical aerial photos and other pertinent data compiled under Task 5. This information will be refined by conducting an electromagnetic (EM) conductivity survey of the boundary, as needed. For planning purposes it is estimated that an EM survey will be conducted at regular intervals along the landfill perimeter to verify the boundaries. A Geonic EM 31 terrain conductivity meter will be used for the survey.

Magnetometer readings will be taken at the designated monitoring well locations to check for buried ferromagnetic materials, possibly drums, and/or buried pipes, conduits, utilities, etc. This technique will be particularly important in locating the monitoring well in the landfill next to the Ohio River. A proton procession Magnetometer will be used by FIT to accomplish this task.

A magnetometer survey was conducted over the entire landfill by Ecology and Environment, Inc. in 1982. Figure 3-1 shows the map prepared by E&E indicating areas of suspected drum burial. These data will be reviewed and considered prior to initiating this work.

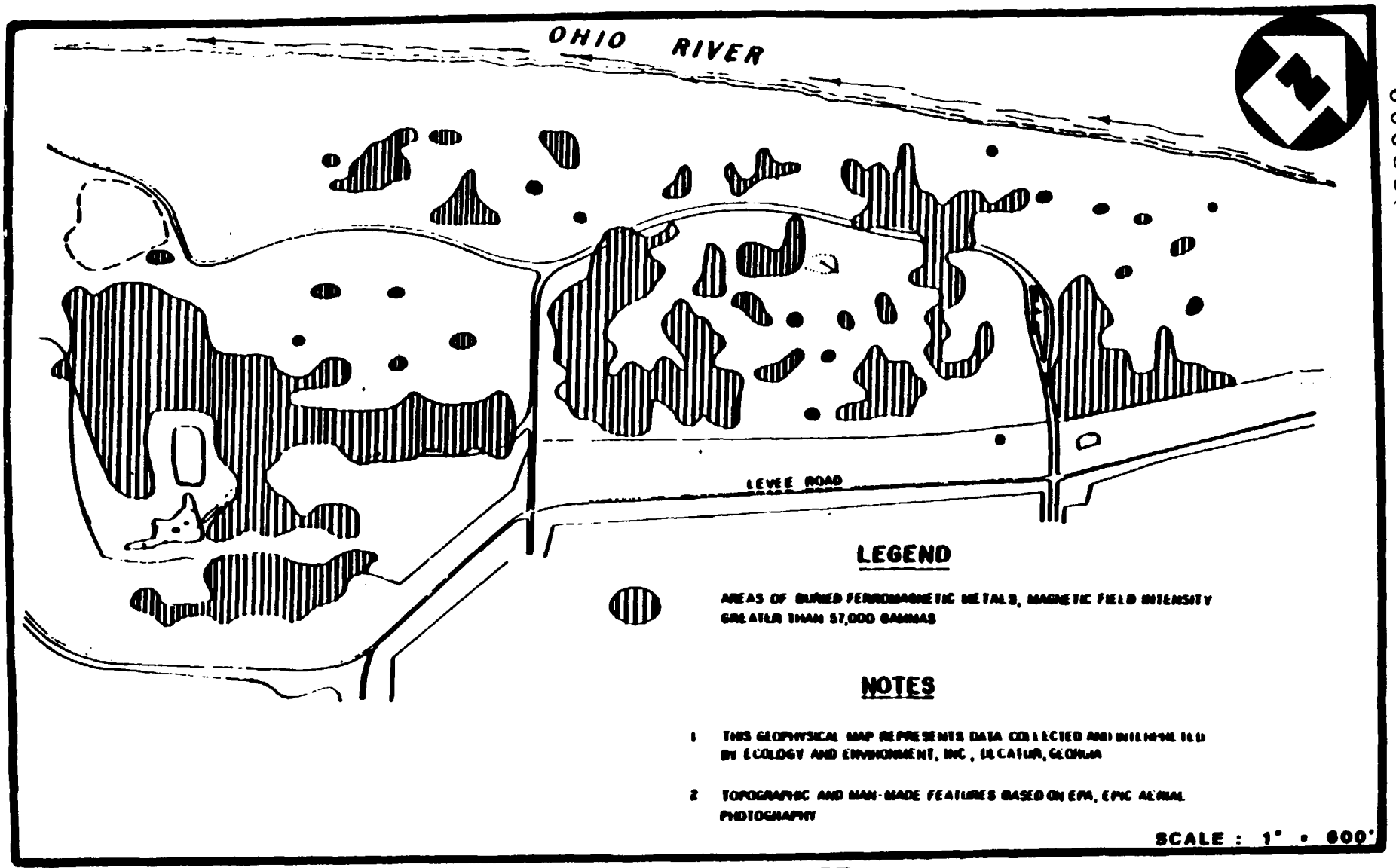
**Task 14 - Groundwater Sampling and Analysis (Existing Wells)**

Previous sampling investigations at the Lees Lane Landfill Site have documented the presence of onsite groundwater contamination; however, sampling of offsite wells has been limited in scope and results have been inconclusive.

The purpose of this task is to determine if contaminants found onsite are also found in groundwater collected from offsite locations proximate to the site. FIT has preliminarily identified and proposes to collect samples from the following four groups of existing wells:

- Private residential wells in Riverside Gardens
- Onsite, shallow monitoring wells installed by the State of Kentucky in 1981
- Nearby industrial supply wells
- Public water supply wells across the Ohio River from the site in Indiana

Under this task, up to 18 existing wells will be identified and sampled, based on the results of Tasks 4 and 5. Table 3-2 presents a summary of the proposed groundwater sampling program, including the new monitoring wells which will be installed by FIT under Task 17. Figure 3-2 shows the approximate locations of proposed wells to be sampled during the RI. All sampling locations (wells) will be located on a regional map; locations will not be surveyed, except for the new FIT




**RESULTS OF THE MAY, 1982 MAGNETOMETER SURVEY AT THE LEES LANE LANDFILL SITE LOUISVILLE, KY.**

**FIGURE 3-1**

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**TABLE 3-2**
**GROUNDWATER SAMPLING KEY**
**TASKS 14 AND 17A**
**LEES LANE LANDFILL SITE**
**(See Figure 3-2)**

| Map Reference Number | Type of Well | Well[1] Depth | Rationale for Sampling |
|---|---|---|---|
| RW-1,2,3,4,5 | Residential | Unknown | To provide water quality data for comparison to previous studies and to aid in the evaluation of the potential for groundwater flow reversal. |
| PW-1 | Industrial - Borden, Inc. | Unknown | To test for contaminants and to provide data to aid in the evaluation of the influence of nearby pumping centers on groundwater contaminant migration. |
| PW-2 | Industrial - Louisville Gas & Electric | Unknown | To test for contaminants and to provide data to aid in the evaluation of the influence of nearby pumping centers on groundwater contaminant migration. |
| PW-3,4,5 | Industrial | Unknown | To test for contaminants and to provide data to aid in the evaluation of the influence of nearby pumping centers on groundwater contaminant migration. |
| MW-1 | New FIT Monitoring Well | 50' | To provide data on upgradient groundwater quality in the upper portion of the alluvial aquifer to determine if different flow zones are present in the water table and to provide upgradient data for comparison to the shallow State monitoring wells onsite. |
| MW-2 | New FIT Monitoring Well | 100' | To provide data on upgradient groundwater quality in the alluvial aquifer above the bedrock. Water levels from this well will be compared to those in MW-1 to estimate the vertical component of flow. |

TABLE 3-2 (Continued)
GROUNDWATER SAMPLING KEY
TASKS 14 AND 17A
LEES LANE LANDFILL SITE
(See Figure 3-2)

| Map Reference Number | Type of Well | Well Depth | Rationale for Sampling |
|---|---|---|---|
| MW-3 | New FIT Monitoring Well | 100' | To test for contaminants and provide data to aid in the evaluation of the potential for offsite migration of contaminants toward Borden, Inc. |
| MW-4 | New FIT Monitoring Well | 100' | To provide data on onsite downgradient groundwater quality in the alluvial aquifer above the bedrock, to aid in the evaluation of the influence of Ohio River flow on groundwater flow at the site, and to aid in the evaluation of the potential for groundwater flow underneath the River. |
| MW-5 | New FIT Monitoring Well | 100' | To test for contaminants and provide data to aid in the evaluation of the potential for offsite migration of contaminants toward the LG&E Power Plant. |
| LL-7 | State of Kentucky monitoring well | 26' | To provide data on onsite groundwater quality in the upper portion of the alluvial aquifer. |
| LL-8 | State of Kentucky monitoring well | 28"9' | To provide data on onsite groundwater quality in the upper portion of the alluvial aquifer. |
| LL-9 | State of Kentucky monitoring well | 35.7' | To provide data on onsite groundwater quality in the upper portion of the alluvial aquifer. |
| LL-10 | State of Kentucky monitoring well | 29' | To provide data on onsite groundwater quality in the upper portion of the alluvial aquifer. |
| LL-11 | State of Kentucky monitoring well | 36' | To provide data on onsite groundwater quality in the upper portion of the alluvial aquifer. |

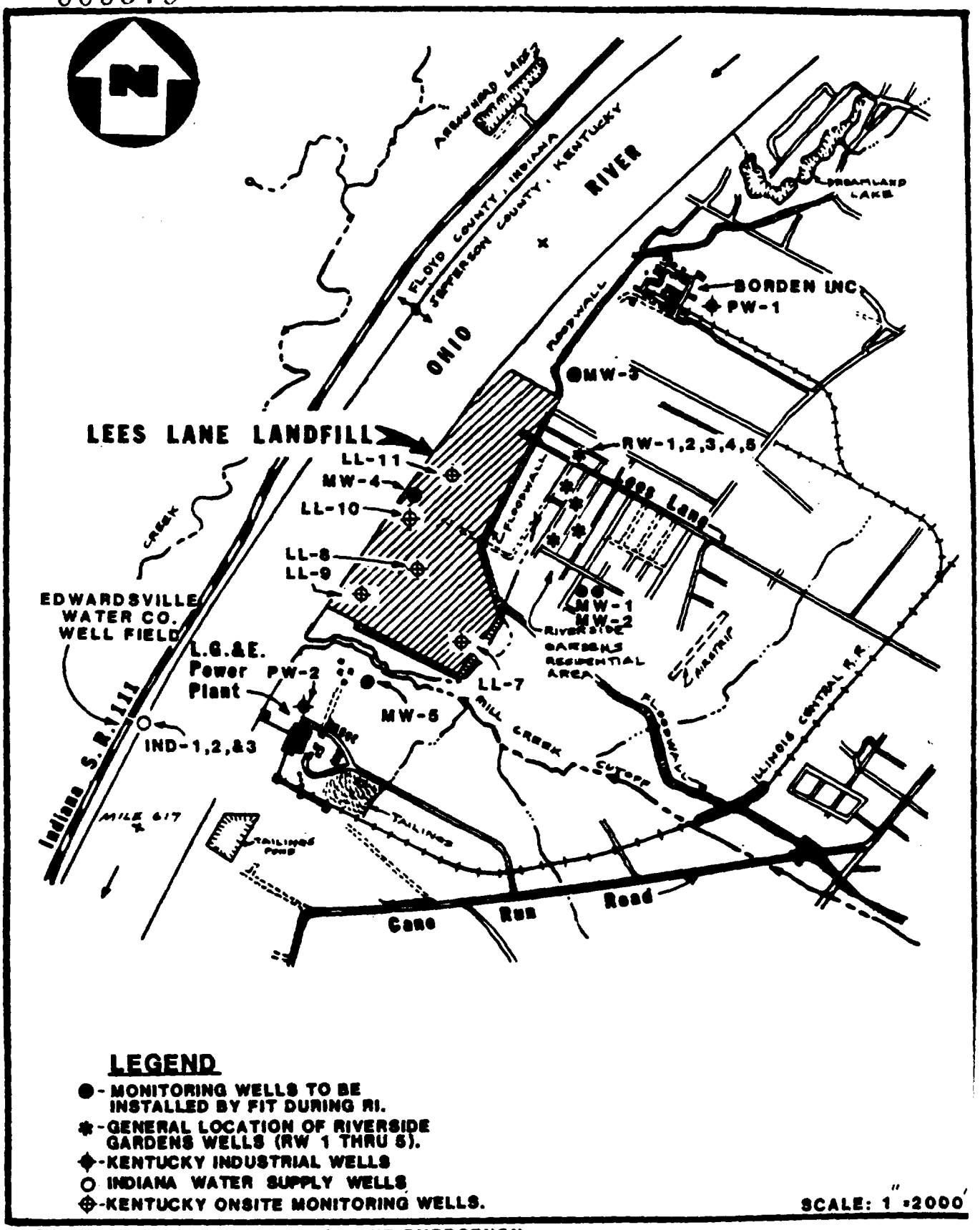
TABLE 3-2 (Continued)
GROUNDWATER SAMPLING KEY
TASKS 14 AND 17A
LEES LANE LANDFILL SITE
(See Figure 3-2)

| Map Reference Number | Type of Well | Well Depth | Rationale for Sampling |
|---|---|---|---|
| IND-1,2,3 | Public Water Supply[2] | 100' | To provide groundwater quality data from the alluvial aquifer immediately above the bedrock across the Ohio River from the site. |

1 Well depths given for MW-1 through MW-5, the New FIT monitoring wells, are the anticipated depths.

2 Edwardsville Water Company

000570




BASE MAP ADAPTED FROM LEES LANE EMERGENCY ACTION PLAN, ECOLOGY AND ENVIRONMENT, FEBRUARY, 1981.

FIGURE 3-2

**PROPOSED LOCATIONS OF WELLS TO BE SAMPLED LEES LANE LANDFILL SITE**



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monitoring wells and any other wells for which water level measurements can be obtained. The locations of the residential wells shown on the map are tentative; precise locations will be established under Task 5. Also under Task 5, up to 3 other industrial supply wells in the vicinity of the site in addition to the Borden, Inc. and Louisville Gas and Electric wells, may be identified for sampling. The selection of these additional wells will be partly based on their location, their depth and their construction.

The 18 wells described under this task, along with the 6 well points to be installed by FIT along the Ohio River under Task 15 and the 5 new monitoring wells to be installed under Task 17, comprise the groundwater monitoring network for the Lees Lane Landfill Site. Analytical results and field measurements for all of the wells and the temporary well point samples will be used to evaluate the potential for and/or the occurrence of offsite migration of contaminants found onsite.

In 1978, EPA collected samples from sixteen private wells in Riverside Gardens. Water from only one of these wells showed high concentrations of metals, which was attributed to the casing and the fact that the well was abandoned. This well and four other wells that were sampled by EPA in 1978 will be sampled by FIT. By comparison, FIT may be able to document changes in water quality and assess the potential for contaminant migration away from the Ohio River toward Riverside Gardens. FIT will select the remaining four residential wells for sampling under Task 5 and at that time will also attempt to collect specific structural information on each of the wells to be sampled.

In 1981 the Kentucky Department of Natural Resources and Environmental Protection (KDNREP) installed five shallow monitoring wells at the landfill in the upper portion of the alluvial aquifer. Subsequently, EPA sampled these wells and found low concentrations of contaminants. These wells are constructed of PVC casing with hand-slotted screens; no gravel packing was used. Due to high levels of sediment in the samples, the results were not considered representative. FIT will inspect the wells and then decide if they can be purged and sampled. If available, up to five wells will be sampled. If necessary, a well point will be installed in one or more wells so a sample can be collected. This will enable FIT to compare the

water quality in the upper portion of the alluvial aquifer to that found in the shallow upgradient well installed by FIT.

Several industries are located along the Kentucky side of the Ohio River in the vicinity of Lees Lane. Borden Inc., immediately north of the site, utilizes groundwater in their processes. The Louisville Gas and Electric Cane Run Generating Station, just south of the site, utilized groundwater in their processes in the past. At present, however, this facility only uses groundwater for fire protection purposes. The pumping of industrial wells in the immediate vicinity of the landfill may directly influence and alter the natural flow characteristics of the groundwater. In order to evaluate the potential for migration of contaminants towards these pumping centers, FIT will sample the wells at the LG&E and Borden facilities and up to three additional industrial wells identified under Task 5. Sampling and hydrologic data obtained from these industries during Task 5 and water levels in the new FIT wells measured under Task 17A will also be used to evaluate the flow characteristics.

In addition to wells on the Kentucky side of the Ohio River, there is a public well field in Indiana, less than one mile downstream of the landfill. Because there is a possibility that groundwater may be moving under the River towards this well field, FIT will collect water samples from up to three of these Indiana wells operated by the Edwardsville Water Company. These will be sampled concurrently with the onsite monitoring wells, to be installed by FIT during the RI (Task 17). As with the Kentucky industrial wells, FIT will collect pertinent data on these wells under Task 5.

On the initial opening of monitoring wells, FIT will use an organic vapor analyzer to measure the concentration of organic vapors in the well head, and then water levels will be recorded. All monitoring wells sampled will be purged three to five volumes and allowed to recharge prior to sampling. Residential, industrial and the water supply wells will be sampled at the nearest available point to the well itself, preferably before the water passes through any type of water treatment. Water will be allowed to run for several minutes prior to collecting a sample for analysis. In the field, pH, conductivity and temperature measurements will be recorded for all samples. Samples will be sent to EPA approved contract labs and analyzed for the following parameters:

- Extractable organic compounds
- Pesticides and PCB's
- Purgeable organic compounds
- Metals, mercury and cyanide
- Carbonate, bicarbonate, sulfates and chlorides.

All sampling equipment will be decontaminated between samples to prevent cross-contamination. All applicable QA/QC procedures, as defined in the Site Operations Plan, will be followed to protect the integrity of the results. If groundwater removal and treatment is determined to be an appropriate remedial alternative, additional data collection may be required.

**Task 15 - Surface Water and Sediment Sampling and Analysis**

Due to the proximity of the Lees Lane Landfill Site to the Ohio River, the potential exists for contaminants to enter the River from the site via surface runoff, flooding of the landfill, leachate seepage from the river bank and discharge of contaminated groundwater. Under this task FIT will attempt to identify the presence or absence and concentration of contaminants in leachate and also if contaminants are present at detectable concentrations in samples collected from a point near shore in the Ohio River. Further, onsite surface waters, including swamps, intermittent streams and areas of ponded water will be sampled to determine if contaminants are present, and if their presence creates a direct contact hazard to the public.

FIT will collect water samples from 6 temporary well points to be installed on the lower terrace of the Ohio River and at 3, near-shore locations on the Ohio River. Water and sediment samples will also be collected from up to 9 locations on the landfill where swamps, intermittent streams or standing liquid is found.

A maximum of 18 water and 9 sediment samples will be collected. Table 3-3 presents a summary of the recommended sampling program and is keyed to Figure 3.3 which shows the proposed sampling locations. Locations may be adjusted based on accessibility and other site conditions. Final locations will be referenced on the topographic map by estimation; they will not be surveyed.

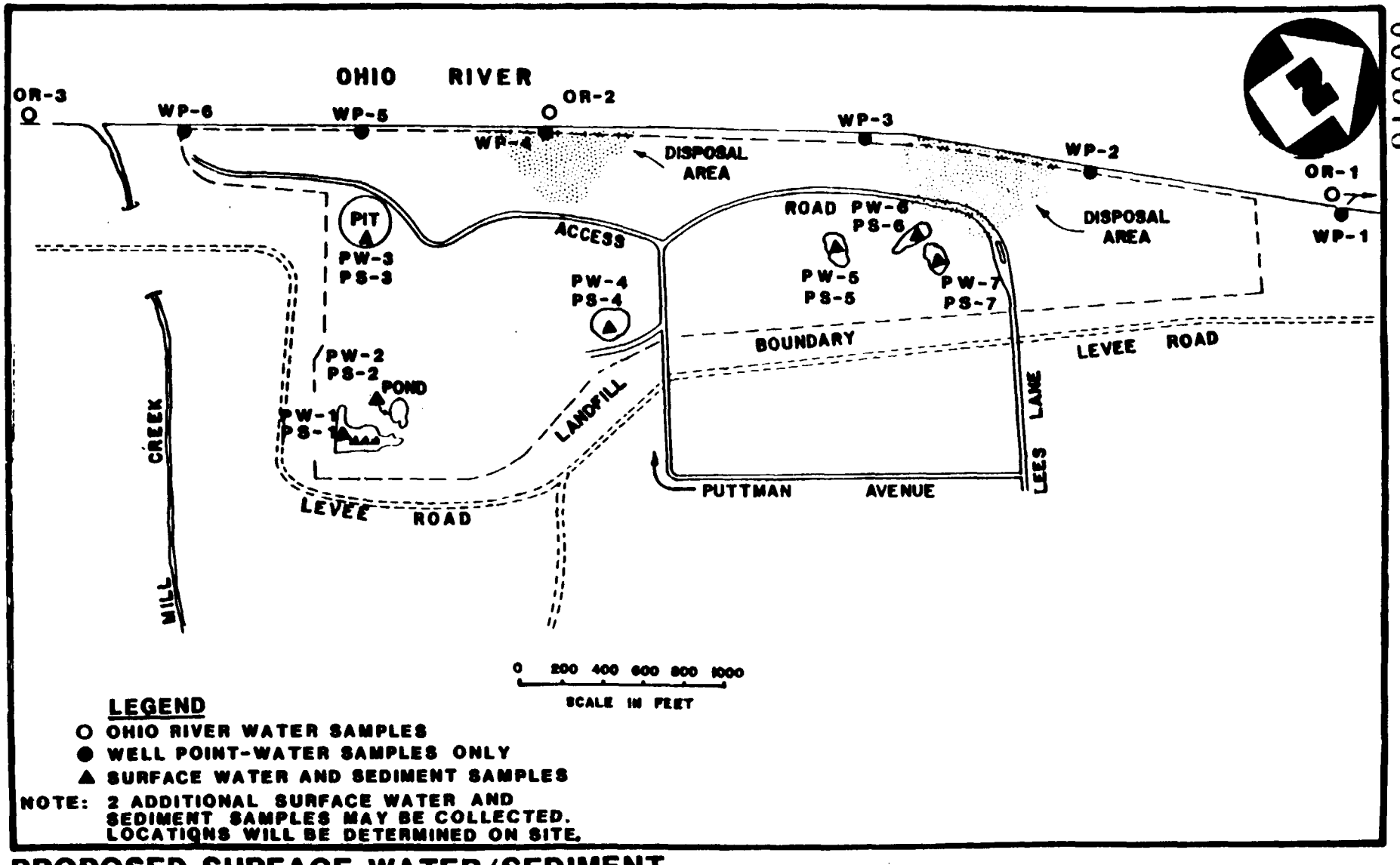
TABLE 3-3
SURFACE WATER AND SEDIMENT SAMPLING KEY
TASK 15
LEES LANE LANDFILL SITE
(See Figure 3-3)

| Map Reference Number | Number Of Samples | Type Of Sample | Rationale for Sampling |
|---|---|---|---|
| OR-1 | 1 | Water | To determine if onsite contaminants are present in the Ohio River upstream of the landfill and to establish background contaminant levels for the River prior to its passage by the site. |
| OR-2 | 1 | Water | To determine if contaminants found in the leachate are also present at increased levels in the Ohio River adjacent to the site. |
| OR-3 | 1 | Water | To determine if contaminants found in the leachate are also present at increased levels in the Ohio River downgradient to the site. |
| WP-1 | 1 | Water | To identify constituents of groundwater discharge to the Ohio River, upgradient of the site. |
| WP-2,3,4,5,6 | 5 | Water | To identify contaminants in the leachate discharging from the site into the Ohio River. |
| PW-1,2,3,4,5,6,7 | 7 | Water | To determine the presence or absence of contaminants in ponded water on the landfill surface, in the form of swamps, intermittent streams and ponds, which may pose a hazard to the public via direct contact and/or runoff. |

TABLE 3-3 (Continued)
SURFACE WATER AND SEDIMENT SAMPLING KEY
TASK 15
LEES LANE LANDFILL SITE
(See Figure 3-3)

| Map Reference Number | Number Of Samples | Type Of Sample | Rationale for Sampling |
|---|---|---|---|
| PS-1,2,3,4,5,6,7 | 7 | Sediment | To determine the presence or absence of contaminants in ponded water on the landfill surface, in the form of swamps, intermittent streams and ponds, which may pose a hazard to the public via direct contact and/or runoff. |
| Total number of samples | 23* | | |

*Two additional onsite ponds may be identified during the site reconnaissance for water and sediment sampling, bringing the total number of samples to 27.




**PROPOSED SURFACE WATER/SEDIMENT AND WELL POINT LOCATIONS LEES LANE LANDFILL SITE LOUISVILLE, KY.**

**FIGURE 3-3**

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The presence of leachate seeps previously noted at the site indicates contaminants may be discharging to the Ohio River. To determine the chemical characteristics of the leachate, FIT will install and sample six temporary well points along the landfill's western side, on the lower terrace. The well points will be constructed of Type 304 stainless steel, two-inch inside diameter casing, with at least one, two-foot section of 0.01 inch slotted screen. They will be installed with a hand-held, gasoline powered auger to a depth of 15 feet or less. These points will be set along the river bank where leachate is observed or expected. They are intended to intercept leachate flowing from the landfill directly into the Ohio River.

FIT will collect water samples from the Ohio River in three locations. One sample will be collected from the River upstream of the landfill, but downstream of any other industrial discharges, to identify contaminants entering the study area along the river bank. One sample will be collected from the River along the bank adjacent to the landfill and near a temporary well point. The last sample will be collected along the bank downstream of the site. All samples will be collected from approximately the same depth. These samples are not intended to characterize Ohio River water quality, but rather to determine if contaminants found in the leachate are also present in increased levels in the Ohio River in the vicinity of the site.

A large swampy area is located in the southeast section of the landfill. Several other areas of ponded water were observed during a FIT visit in March 1984. Water and sediment samples will be collected from up to nine of these areas to determine the potential for direct contact hazard to the local public and the potential for runoff of onsite contaminants into the Ohio River. This data will be used during the FS to evaluate sediment/water removal and/or capping as a remedial action.

The water samples will be analyzed in the field for pH, conductivity, and temperature. Both the water and sediment samples will be sent to EPA approved contract labs and analyzed for the following parameters:

- Extractable organic compounds
- Pesticides and PCB's

- Purgeable organic compounds
- Metals, mercury and cyanide.

All sampling equipment will be decontaminated between samples to prevent cross contamination. All applicable QA/QC procedures, as defined in the Site Operations Plan, will be followed to protect the integrity of the results. If a leachate collection system is determined to be an appropriate remedial measure, additional data collection may be required.

**Task 16 - Surface Soil Sampling and Analysis**

To date, no surface soil samples from the landfill have been analyzed. Contamination of surface soils may have resulted from leaking drums stored on the surface, from spillage during flooding or site cleanup activities, and from wastes disposed directly on the ground surface. If surface soils are contaminated, they may pose a hazard to the public through direct contact and through the inhalation/ingestion of toxic airborne particulates. Erosion of these surface soils and runoff into the Ohio River or other offsite areas may create a potential environmental hazard.

A limited number (12) of surface soil samples will be collected and analyzed under this task. These samples are intended to identify contaminants posing direct contact and runoff hazards only. A majority of the site is covered and stabilized by thick vegetative growth, including a stand of mature trees along the landfill's western boundary. Areas showing signs of vegetative stress and/or areas where no vegetative growth occurs will be sampled to determine if contaminants are present and if cover or removal is warranted. No effort will be made to collect representative soil samples from the entire landfill. Only those areas of obvious or suspected contamination will be sampled to determine if a direct contact hazard exists. If so, the need to cover or excavate these areas, or to control runoff and fence the site will be evaluated in the FS.

Initially, FIT will conduct a review of the existing data to determine where drums have been staged in the past (see Task 5). A visual inspection of the site will be

made to locate denuded areas. FIT will also use an organic vapor analyzer to aid in the selection of contaminated areas. FIT will select up to 11 onsite locations and will collect a sample from the top six inches of soil in each location. A background sample will be collected from a natural area offsite, in Riverside Gardens, if possible. Sample locations may be adjusted based on accessibility and other site conditions. Final locations will be shown on the topographic map by estimation; they will not be surveyed.

The samples will be sent to EPA approved contract labs and analyzed for the following parameters:

- Extractable organic compounds
- Pesticides and PCB's
- Purgeable organic compounds
- Metals, mercury and cyanide.

All sampling equipment will be decontaminated between samples to prevent cross-contamination. All applicable QA/QC procedures, as defined in the Site Operations Plan will be followed to protect the integrity of the results.

**Task 17 - Subsurface Investigation - Drilling**

A subsurface investigation will be conducted at the Lees Lane Landfill Site for the purpose of providing information on local lithology, hydrogeology and the nature of the alluvial aquifer, and depth of fill material, as well as to provide sampling and testing points for the collection of groundwater quality and flow data.

A total of five monitoring wells, four deep and one shallow, will be installed in the alluvial aquifer. Table 3-4 gives the construction details and Figure 3-2 shows the locations of the wells. The deep wells will be completed at the bedrock surface (approximately 100 feet below ground surface). A core of the shale bedrock will be taken from each location to verify that the wells are set on bedrock, since large boulders have been encountered in the lower zone of the alluvium. Installation of monitoring well MW-4, which will be installed through fill material, will require a

**Table 3-4**
**Description of Proposed Monitoring Wells**
**Task 17 - Subsurface Investigation**
**Lees Lane Landfill Site**

| Location | Well No. | Anticipated Total Depth (ft) | Screened Interval (ft) | Anticipated Depth Screened (ft) |
|---|---|---|---|---|
| East of landfill | MW-1 | 50 | 10 | 40-50 |
| East of landfill | MW-2 | 100 | 5 | 95-100 |
| North of landfill | MW-3 | 100 | 35 | 65-100 |
| Landfill midway along Ohio River* | MW-4 | 100 | 5 | 95-100 |
| South of landfill | MW-5 | 100 | 35 | 65-100 |

* Drilling expected to require Level B protection.

surface casing set and cemented in place to seal off the fill to prevent contaminant migration down the borehole.

The anticipated well depths and rationale for placement of each of the monitoring wells is presented in Table 3-2, under Task 14.

Monitoring wells MW-3 and MW-4 will be equipped with continuous recording, water level indicators, on a 30-day cycle. The gage scale selected is 1:10, recording a 10-foot water level change per drum revolution. The purposes of obtaining these data are to investigate the effects of industrial pumping to the north of the site on the groundwater level and flow direction, and to investigate the potential for groundwater flow reversals at the site as a result of flow characteristics of the Ohio River. Due to the relatively short term of the RI, a limited number of hydrologic measurements will be made and only a limited portion of the annual hydrological cycle will be encountered. These constraints may make it impossible to adequately define both groundwater flow and reversal characteristics.

In addition to the proposed monitoring wells, the onsite Kentucky monitoring wells will be used to collect water table data. Water level measurements will be made in selected wells on a regular basis when FIT is onsite. A complete round of water levels will be taken in the new FIT wells and used to prepare a water table contour map for the site.

The proposed well locations are preliminary and may be adjusted based on accessibility and other site conditions. If the results of the RI indicate a need to remove or treat groundwater beneath the site, it may be necessary to collect additional information.

Drilling Details

The boreholes for monitoring wells MW-2, MW-3 and MW-5 will initially be drilled using hollow-stem augers so that split spoon samples can be collected and to facilitate the determination of the depth of the top of the water table. The mud

rotary drilling method using an 8-inch drag bit will be used to complete these boreholes as well as those for monitoring wells MW-1 and MW-4. In well MW-4, a 12-inch drag bit will be used to make the borehole for the surface casing and then an 8-inch bit to complete the borehole below the area of the fill.

Quality Control samples will be collected twice during the drilling. These will include samples of the mud mixture, the gravel pack, and each source of water used for drilling operations and for decontamination procedures. All aqueous samples will be analyzed for the same constituents as the groundwater samples collected and analyzed under Task 17A.

All drilling operations and well construction procedures will be instituted to minimize the potential of cross-contamination. Decontamination of the drill rig, drilling equipment and sampling apparatus will be performed between boreholes. Drilling operations will proceed from the area expected to be the least contaminated to the area expected to be the most contaminated. At the Lees Lane Landfill Site, the upgradient and offsite wells will be constructed first, and the well located in the landfill will be installed last.

Soil samples will be taken in each of the augered boreholes for lithologic determination. The samples will be taken at 5-foot intervals or at changes in lithology using a 2-inch diameter, 18-inch long split-barrel sampler (ASTM D-1586). Thin-walled tube samplers (ASTM D-1587), Shelby tubes, will be taken at the discretion of the site geologist if a confining bed is encountered. The laboratory tests on the Shelby tubes, if taken, will include permeability and porosity which will help define any potential confining characteristics. The onsite geologist will maintain a detailed log for each boring including monitoring well construction.

Well Construction & Installation

All monitoring wells will be constructed using 4-inch nominal diameter, schedule 5, stainless steel casing with threaded flush joints and stainless steel manufactured wire-wound screen. The screen opening (slot size) will be 0.010-inch. An artificial gravel pack made up of quartz sand/gravel will be emplaced around the screen and

will extend approximately 5 feet above the screen. A sample of the gravel pack will be collected from each source and analyzed. A bentonite seal of at least 2 feet will be installed immediately above the gravel pack to prevent vertical migration of contaminants through the borehole. The remaining annular space between the casing and borehole will be backfilled with a cement/bentonite slurry to the ground surface. A protective surface casing will be set and cemented in place around the monitoring well installed in the fill. A protective steel casing with locking cap will be emplaced around all five wells.

Well Development

Monitoring wells will be developed after installation to remove fines and clean the well screens. The development process will be accomplished using either surging and bailing; pumping, using compressed air; or combinations of these. Each well will be developed until samples withdrawn are visibly free of sediment. Static water levels will be measured and recorded prior to development, and again after the wells recover from development.

In-Situ Hydraulic Conductivity Testing

Hydraulic conductivity tests will be performed on up to five monitoring wells completed in the alluvial aquifer. Tests may be "rising head" or "falling head" hydraulic conductivity tests. Rising head tests involve the removal of a known volume and measurement of the rate of recovery of the well over time. Falling head tests involve the addition of a known volume and measurement of recovery over time. The site geologist will decide the type of test to be performed.

**Task 17A - Groundwater Sampling and Analysis (New Wells)**

The groundwater sampling program for the Lees Lane Landfill Site has been designed to determine the presence or absence and the concentration of contaminants in the alluvial aquifer at the site. It is also designed to investigate the potential for migration away from the site through the alluvial aquifer toward

nearby industrial pumping centers, into the Ohio River, toward Riverside Gardens during periods of flow reversals, and/or beneath the Ohio River toward public supply wells in Indiana.

The five new monitoring wells installed under Task 17 will be sampled following well development. Samples will be analyzed for:

- extractable organics
- purgeable organics
- pesticides and PCB's
- metals, mercury and cyanide
- carbonate, bicarbonate, sulfates and chlorides

Field parameters, including pH, temperature and specific conductance will be measured at the time of sample collection.

The public water supply wells (Edwardsville Water Company) across the Ohio River from the site, in Indiana, described under Task 14, will be sampled at approximately the same time as the new monitoring wells and analyzed for the same parameters. Analyses for carbonate, bicarbonate, etc., may help evaluate whether or not the same aquifer is being sampled. Provisions will be made for quick turnaround of the sampling results for all of these wells so that results can be obtained in a timely manner relative to acquisition of the rest of the RI data.

The total depth of the monitoring wells will be measured prior to sampling. Water-level measurements will also be recorded. Prior to sampling, wells will be purged using a stainless steel or teflon coated bailer or suitable pump. Each well will be pumped or bailed until thoroughly flushed and 3 to 5 well volumes have been removed. The well will be allowed to recharge and a second water level will be measured. The water samples will be withdrawn using a stainless steel or teflon bailer. FIT will collect pertinent information on the water supply wells relevant to the time of sampling.

The data collected from the onsite monitoring wells will be evaluated in light of data collected from sampling residential and industrial wells in the vicinity of the site under Task 14, Groundwater Sampling and Analysis (Existing Wells), and from the temporary well points installed along the Ohio River bank to collect leachate samples under Task 15, Surface Water and Sediment Sampling and Analysis. Compilation and analysis of these data should provide adequate information to describe onsite groundwater contamination, should it exist, and to evaluate the potential for or existence of offsite migration of contaminants.

**Task 18 - Gas Migration Investigation**

The existing gas migration control system at the Lees Lane Landfill Site has been in operation since October, 1980. The system is reported to be comprised of 21 gas evacuation wells located just inside the landfill property boundary. The wells are 25-35 feet deep and are connected via an underground header line to an above-ground blower house which disperses the gases.

The purpose of this task is to evaluate the effectiveness of the existing system with regard to long-term health and safety issues, including the presence of and concentrations of methane and other organic vapors onsite and in the neighborhood. At this time, it is anticipated that the sampling and evaluation work will be conducted through EPA Headquarters Environmental Hazardous Support Division, Emergency Response Branch (ERB), Edison, New Jersey. The study design will be coordinated by FIT and EPA, Region IV, in cooperation with ERB. Only those man-hours and costs associated with the FIT coordination activities are included in the Work Plan.

**Task 19 - Bank Erosion Investigation**

The Lees Lane Landfill Site abuts the Ohio River on its western boundary and has been subject to flooding and bank erosion. Surface runoff from the site has created deep erosional cuts into the river bank. Stabilization of the river bank may be needed to prevent further erosion and exposure of the fill material.

Currently there are a number of drums exposed on the upper terrace of the river bank. This investigation will include locating the drums on the topographic map and evaluating whether the drums have been exposed by erosion or were originally disposed of on the upper terrace. This evaluation will rely heavily on interpretation of the EM survey data of the landfill boundary along the river collected under Task 13, Geophysical Investigation.

The investigation will also include conducting a thorough visual inspection of the river bank to identify areas of severe erosion and potential embankment failure. All suspect areas will be referenced on the topographic map.

The overall analysis of river bank conditions will address the immediate and the long-term need for bank erosion controls. Appropriate erosion control technologies will be identified. The final analysis of need for remediation and selection of an appropriate remedial technology will be conducted under the FS (Tasks 24 to 28), since any action taken on the river bank must be coordinated with other site remediation measures.

**Task 20 - Topographic Mapping**

Due to excessive ground cover, the existing topographic map of the landfill (prepared under Task 35) may be inadequate for FS planning purposes. If, during the course of the RI, FIT and EPA determine that the existing topographic map will be inadequate for the FS, then FIT will request that EPA arrange to have the EPIC prepare a new topographic map. The map will be prepared to the same specifications as the existing map; however, it will be based on aerial photogrammetry of the site obtained during the fall or winter months, when foliage is sparse. FIT will be responsible for providing ground control for the aerial work and for ground truthing the new preliminary map, if necessary.

**Task 21 - Data Reduction and Evaluation**

Data generated throughout the RI will be reduced and evaluated as it becomes

available. Continuous data reduction and evaluation will provide input for subsequent RI tasks and contribute to the cost effectiveness of work performed.

The data evaluation will include assessment of its adequacy and completeness. This will enable a continued effort to identify and augment any data gaps. Comparisons will be made between the RI data and pertinent information collected from previous studies, as appropriate. Where applicable, integration of these data sets will be performed to supplement the data evaluation.

Computer analysis of data collected under Tasks 13, 17 and 17A may be required for data reduction and evaluation. EPA has arranged for FIT to access its IBM mainframe computer at Research Triangle Park, North Carolina, through the Region IV mini-computer and to perform all computer analyses.

Following the completion of all the field tasks, the results of this data evaluation task will be used in the development of the RI Report (Task 23).

**Task 22 - Identification of Preliminary Remedial Technologies**

During the RI, a list of remedial technologies which may be implemented at the site will be considered to ensure that a sufficient data base is developed during onsite activities. The applicability of these technologies will be evaluated, based on the results of the RI, under this task. The resulting preliminary remedial technologies will be used to develop the remedial alternatives in Task 24.

On the basis of presently available data and program requirements, the following preliminary list of remedial options has been identified. This list may be expanded or refined, assuming that the no action alternative is not selected.

1. Surface sealing/capping
2. Surface runoff controls
3. Groundwater barriers

4. Groundwater removal and treatment and/or disposal
5. Soil and/or sediment excavation and treatment and/or disposal
6. Alternative water supplies
7. Point-of-use groundwater treatment
8. Fencing and posting signs
9. Drum removal
10. Ohio River bank stabilization
11. Leachate collection and treatment and/or disposal
12. Removal and/or treatment of surface contaminants
13. Gas collection and/or treatment

**Task 23 - Remedial Investigation Report and Feasibility Study Work Plan**

Remedial Investigation Report

After completion of the field investigations, all pertinent field and laboratory data will be assembled into a detailed report of the RI. This report will include the following subjects:

- Review of the RI objectives
- Description of the study area, including sampling locations, site facilities, and results of well surveys
- Methodologies employed in the study
- Surface features of the site, including a topographic map
- Subsurface geologic conditions in the vicinity of the site from well logs and descriptions of borehole lithology
- Hydrogeologic conditions in the immediate vicinity of the site, including the depth to groundwater, and the direction of groundwater flow at the time of sample collection
- Transport pathways of contaminants away from the site
- Quality of surface water and groundwater in the vicinity of the site and adjacent areas of use
- Surface soil contamination as a direct contact hazard

- Evaluation of the operating efficiency of the existing methane gas collection system and the need for treatment
- Air contamination as a threat to the public health and welfare
- Erosion potential of the Ohio River bank
- Conclusions and recommendations of the study

A draft RI report will be submitted to EPA for review. After the receipt of EPA comments, the final RI report, which will incorporate these comments, will be submitted to the EPA Remedial Project Manager.

Feasibility Study Work Plan

Data generated during the RI Report will be used to revise the Work Plan for the Feasibility Study. The revised FS Work Plan will include a detailed schedule and budget for the activities to be undertaken.

## 3.4 Feasibility Study (Phase III)

The FS will develop and evaluate remedial alternatives consistent with all EPA administered laws, identify the cost effective remedial action to be recommended, and produce a conceptual design and final report. Review and approval of each task will be coordinated with EPA as applicable. The first task of the FS, the Endangerment Assessment, is shown as Task 34 in Phase IV since it will be conducted by REMPO.

### Task 24 - Development of Remedial Alternatives

A series of remedial technologies will have been identified in Task 22. The development of remedial technologies into remedial alternatives will be accomplished as follows:

Establish the Remedial Response Objectives

The site-specific cleanup objectives for response will be established based on Section 300.68(g) of the National Contingency Plan (NCP) and any other applicable Federal and State statutes. The objectives will be used to identify the remedial alternatives.

Identify the Remedial Alternatives

Appropriate remedial technologies (listed in Section 300.70 of the NCP but not inclusive of these) will be identified for the established site objectives. These technologies will be evaluated singly and in combination, as remedial measures, to determine how well they meet the established remedial response objectives. One or more remedial measures may be combined, as necessary, to develop a viable remedial alternative.

**Task 25 - Initial Screening of Alternatives**

The alternatives developed and addressed in Task 24 will be screened to eliminate alternatives that are clearly not feasible or appropriate, prior to undertaking detailed evaluations of the remaining alternatives.

Three considerations will be used as a basis for the initial screening. These are cost, effects of the alternative, and availability of acceptable engineering practices. A more detailed explanation of these three considerations is given in Section 300.68(h) of the NCP.

**Task 26 - Laboratory and Field Studies Work Plan Preparation**

Laboratory and supplemental field studies may be required to evaluate the effectiveness of remedial technologies and/or establish engineering criteria. Because these studies will entirely depend on the results of the Remedial Investigation and Feasibility Study tasks, they are not described herein. A separate

Work Plan will be prepared for any additional studies and will be submitted to EPA for approval. The costs presented herein include only those required for preparation of the additional Work Plan(s) and not execution of the studies.

**Task 27 - Remedial Alternatives Evaluation and Preliminary FS Report**

Remedial Alternatives Evaluation

The limited number of alternatives that pass through the initial screening in Task 25 will be evaluated in greater detail and a recommendation will be made for the cost effective alternative (i.e., as stated in Section 300.68(j) of the NCP **"the lowest cost alternative that is technologically feasible and reliable and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, or the environment"**). The detailed analysis of each alternative will include as a minimum the following steps taken from Section 300.68(i) of the NCP.

1. **"Refinement and specification of alternatives in detail, with emphasis on use of established technology:"**

   Alternatives will be detailed only to the extent necessary to perform a comparison based on the criteria in steps 2 through 5.

2. **"Detailed cost estimates, including distribution of costs over time:"**

   Monetary cost will be presented as a present worth cost. This will include the cost of implementing the alternative plus operating and maintenance costs.

3. **"Evaluation in terms of engineering implementation, or constructability:"**

   Engineering judgement will be used to limit alternatives to those that rely on proven technology and standard construction methods.

4. **"An assessment of each alternative in terms of the extent to which it is expected to effectively mitigate and minimize damage to, and provide adequate protection of, public health, welfare, and the environment, relative to the other alternatives analyzed:"**

Criteria will be established jointly with EPA to determine acceptable limits of contaminants or engineering criteria.

5. **"An analysis of any adverse environmental impacts, methods for mitigating these impacts, and costs of mitigation."**

These effects will be considered during the evaluation of steps 2 and 4.

Also, each alternative will be evaluated so as to be in compliance with all environmental laws administered by EPA.

In order to choose a remedial alternative as "cost effective" and to satisfy the criteria stated in steps 2 through 5 above, comparison parameters will be established. A methodology will then be developed for the decision process used in selecting a cost effective remedy.

Preliminary FS Report

A preliminary report presenting the results of Tasks 24 through 28 and the recommended remedial alternative will be prepared and submitted to EPA for review and approval.

**Task 28 - Conceptual Design of Remedial Action**

A conceptual design of the cost-effective remedial action selected by the EPA will be prepared by FIT. The conceptual design will include, but not be limited to, the engineering approach, including implementation schedule; special implementation requirements; institutional requirements; phasing and segmenting considerations; preliminary design criteria; preliminary site and facility layouts; budgeted cost

estimates (including operation and maintenance costs); operating and maintenance requirements, and duration; and an outline of the safety plan, including cost impact on implementation. Any additional information required for the completion of the final remedial design will be identified.

**Task 29 - Preparation of Final FS Report**

A final report will be prepared and submitted to EPA. The report will include the preliminary FS Report prepared under Task 27 and details of the conceptual design developed under Task 28, and will append any supplemental information. The report will be labeled as "draft" and all copies stamped "enforcement confidential". All copies will be numbered and a cover letter recording distribution of numbered copies will be attached to each copy. One unbound, camera-ready copy (without the enforcement confidential stamp) will also be provided.

## 3.5 Remedial Planning Office Technical Assistance (Phase IV)

The REMPO will provide technical assistance to the FIT Office under Phase IV, encompassing Tasks 30 through 35. Task 34, the Endangerment Assessment, will be completed as the first task of the Feasibility Study.

**Task 30 - RI/FS Work Plan Preparation**

REMPO prepared the first four drafts of the Lees Lane Site RI/FS Work Plan, incorporating comments from FIT and EPA review. Man-hours and other direct costs incurred during completion of this task are incorporated under this task. No additional costs will be charged to this task.

**Task 31 - REMPO Status Reporting**

A Work Assignment Status Report and a Financial Management Summary Report will be submitted monthly to EPA. These are outlined in Section 4.2.1 of the Management Plan.

**Task 32 - REMPO Community Relations Support Functions**

A community relations (CR) program will be carried out concurrent with implementation of the Work Plan. EPA will provide the lead in this program, and REMPO and FIT will provide support services as requested. A community relations plan has been prepared by REMPO under a separate work assignment. The FIT support functions have been described under Task 3. The CR program will have the following objectives:

- Implementation of an effective plan for public involvement
- Solicitation of available information and comments on site operations and conditions
- Dissemination of information to the community on current and proposed actions
- Maintenance of a dialogue with the community
- Analyses of community attitudes toward proposed actions

The first step in the program will be the designation of a REMPO project community relations coordinator who will organize support services for the CR program. This community relations specialist will be available as needed and will provide services including: organizing public meetings and news conferences; preparing public notices and news releases; receiving available information and comments; and disseminating information to the proper parties. The activities of the REMPO CR Coordinator will be directed and approved by the EPA Remedial Project Manager. The REMPO CR Coordinator may be aided in these duties by the FIT community relations coordinator, particularly during the Initial Activities and Remedial Investigation Phases of the study.

**Task 33 - REMPO RI/FS Technical Assistance**

Throughout the conduct of the RI/FS, REMPO technical staff will be available to FIT for consultation and guidance as necessary. EPA will be apprised of the need for technical consultation and will have the opportunity to provide the necessary guidance/information.

**Task 34 - Endangerment Assessment**

The Endangerment Assessment will be completed by REMPO as the first task of the Feasibility Study. The Endangerment Assessment will evaluate the extent to which hazardous substances may pose a danger to public health, welfare, or the environment, in accordance with the outline presented in Table 3-5. A separate deliverable document will be submitted to EPA and will be approximately 10 to 12 pages in length.

**Task 35 - Topographic Mapping**

A topographic map of the site has been prepared by REMPO under a subcontract. The map was prepared using aerial photogrammetric methods. The map was prepared with a horizontal scale of 1 inch = 200 feet and 2 foot contour intervals on scribed double matte, 3 mil, washoff mylar with reversed image. Horizontal and vertical ground control was established by REMPO. All vertical elevations were referenced to the National Geodetic Vertical Datum (NGVD).

The aerial photographs which served as the basis for preparation of the map were taken in June, 1984. Due to extent of foliation and ground cover at that time many areas of the landfill were obscured from sight; and therefore, the topography of these areas are not accurately delineated on the map. In the event that details of these areas are needed for Feasibility Study planning, another topographic map may have to be prepared, based on aerial photogrammetry obtained during a period of defoliation. If necessary, this map will be prepared under Task 20 of the Remedial Investigation.

The man-hours and costs assigned to this task cover work already performed. No additional costs will be charged to this task.

**TABLE 3-5**

**PREPARATION OF AN ENDANGERMENT ASSESSMENT**

**I. Introduction**

A. NCP provisions Sections 300.65, 300.67 and 300.68

B. Description of an endangerment assessment
   1. Done to various degrees in all hazardous waste cases.
   2. Qualitative assessments done for negotiated settlements and orders.
   3. Quantitative assessments may be done for civil litigation cases.

**II. Factors Considered in an Endangerment Assessment**

A. Contaminants found at the site
   1. Identity, type
   2. Quantity
   3. Form
   4. Manner of disposal
   5. Concentrations in environmental media
   6. Ambient levels

B. Factors affecting migration
   1. Topography
   2. Soil environment
   3. Geological environment
   4. Hydrological characteristics
   5. Climate

C. Environmental fate of contaminants
   1. Physical & chemical characteristics of contaminants
   2. Movement from one environmental media to another
   3. Hydrogeological/Geochemical characteristics
   4. Evidence of migration

**TABLE 3-5 (continued)**
**PREPARATION OF AN ENDANGERMENT ASSESSMENT**

D. Exposure evaluation
   1. Population exposed
   2. Routes of exposure
   3. Extent of exposure

E. Toxicity evaluation - Literature Review
   1. Environmental toxicology
   2. Human toxicology

F. Impact evaluation
   1. Reported environmental stresses (fish kills, vegetative stress)
   2. Reported public illnesses
   3. Comparison of environmental concentrations with EPA or other Federal agency standards, criteria or guidelines.

**III. Quantitative Risk and Exposure Assessments for Litigation**

A. Site specific application of qualitative assessment parameters for exposure
B. Carcinogenic risk assessment
C. Acceptable daily intake for non-carcinogens

**IV. Quality Assurance**

# 4.0 MANAGEMENT PLAN

Section 4.0 of this Work Plan outlines the management plan which will be used to direct the Lees Lane Landfill Site RI/FS. It is presently planned that all work will be directed by FIT, with technical assistance from REMPO, if needed, and as directed by ZPMO.

## 4.1 Project Organization

### 4.1.1 Project Manpower Plan

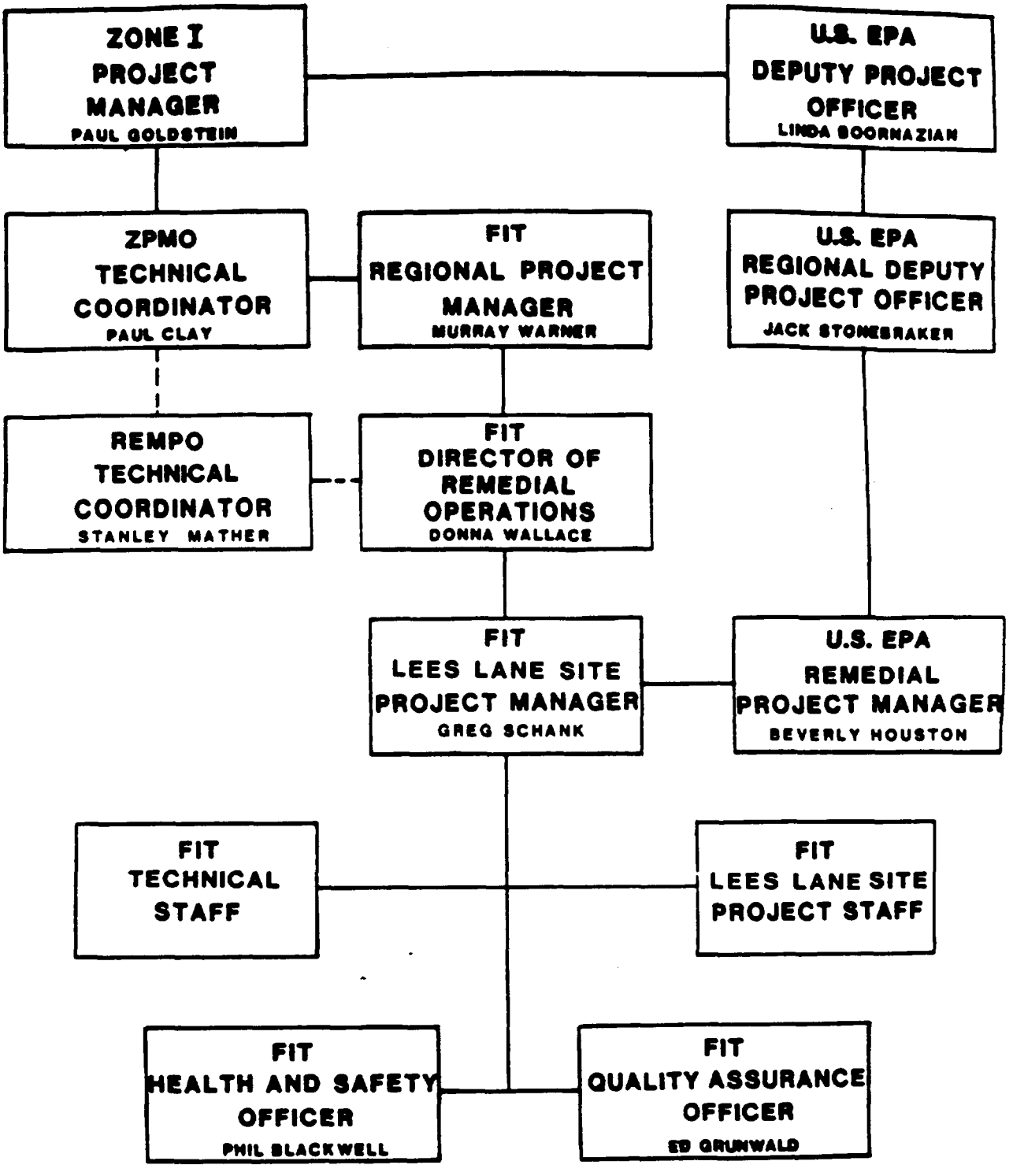
The Remedial Planning Manager, through the REMPO Director of Projects, provides management of REMPO technical assistance activities, and also serves as the primary liaison to the EPA Project Officer at EPA Headquarters.

The FIT Regional Project Manager has designated a Lees Lane Landfill Site RI/FS project team headed by the FIT Project Manager, Mr. Greg Schank, who will work directly with the EPA Remedial Project Manager. Mr. Schank will report directly to Ms. Donna Wallace, FIT Director of Remedial Operations. The project team will handle all aspects of the Initial Activities (Phase I), the Remedial Investigation (Phase II), and the Feasibility Study (Phase III), with technical assistance provided by REMPO (Phase IV), as needed. Mr. Stanley Mather will coordinate REMPO technical assistance activities. The specific individuals responsible for management of the project are shown in Figure 4-1.

### 4.1.2 Interface Requirements

The FIT Office, with aid from approved subcontractors, will perform all phases of the Lees Lane Landfill Site RI/FS under the direction of the FIT Project Manager.

Mr. Don Senovich, Remedial Planning Office Manager, will oversee all work performed at the REMPO. He will also serve as the liaison between the office and contract administrators at EPA Headquarters in Washington, D.C. The ZPMO will also oversee the distribution of the Lees Lane Landfill Site project reports to EPA Headquarters and the EPA Regional Office in Atlanta.




**PROJECT ORGANIZATION**
**REMEDIAL INVESTIGATION AND FEASIBILITY STUDY**
**LEES LANE LANDFILL SITE**
**LOUISVILLE , KY.**

FIGURE 4 - 1

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Mr. Murray Warner, FIT Regional Project Manager, will oversee all work performed at the FIT Office. Ms. Donna Wallace, FIT Assistant Regional Project Manager and Director of Remedial Operations, will direct all work performed at the FIT Office. Mr. Greg Schank, FIT RI/FS Project Manager, will manage the project team and all work on the project performed by the team. Mr. Schank will maintain close coordination with Ms. Beverly Houston, EPA Remedial Project Manager. All information requests received by FIT or REMPO from non-EPA individuals, businesses, or organizations will be referred to the EPA.

### 4.1.3 Field Operations

Mr. Schank, the FIT Project Manager, will coordinate all field activities through Mr. Phil Blackwell, FIT Assistant Regional Project Manager and Director of Field Operations, and Ms. Beverly Houston, EPA Remedial Project Manager.

## 4.2 Project Reports

### 4.2.1 Project Status Reports

A Work Assignment Status Report and a Financial Management Summary Report will be submitted monthly. The contents of each report are as follows:

- Work Assignment Status Report
  - Identification of site and activity
  - Progress during the period
  - Problems resolved
  - Anticipated problem areas and recommended solutions
  - Deliverables submitted
  - Upcoming events
  - Activities planned
  - Key personnel changes
  - Subcontracting
  - Travel during the period
  - Contract Laboratory Program
  - Schedule changes

- Financial Management Summary Report
  - Identification of site and activity
  - Actual expenditures, including fee and direct labor hours expended for this period
  - Cumulative expenditures (including fee) and cumulative direct labor hours
  - Projection of expenditures for completing the project, including an explanation of any significant variation from the forecasted target
  - A graphic representation of proposed versus actual expenditures (plus fee) and comparison of actual versus target direct labor hours. A projection-to-completion will be made for both.

Project status reports will be distributed monthly as follows:

| Technical Progress Reports | Financial Management Reports | Addressee |
|---|---|---|
| 2 | 2 | Contracting Officer (if applicable) |
| 2 | 2 | Zone Manager (EPA Headquarters) |
| 2 | 2 | EPA Project Officer (Region IV) |

### 4.2.2 Interim, Draft, and Final Reports

Major task deliverables will be submitted to EPA as drafts for review and comment. In addition to the current Work Plan, the following major RI/FS deliverables are anticipated:

- Draft RI Report
- Final RI Report
- Revised FS Work Plan, if warranted
- Endangerment Assessment
- Preliminary FS Report
- Final FS Report including the conceptual design of the selected alternative

Internal draft reports will be sent from FIT to ZPMO for review prior to submittal to the EPA. ZPMO will coordinate additional technical review as requested by FIT or as directed by the Zone Project Manager. EPA will review the draft report and submit comments to FIT for discussion between the FIT Project Manager and the ZPMO Technical Coordinator. Review comments will be included in the final report as necessary. The revised final report will be submitted to EPA by FIT.

### 4.2.3 Project Review Meetings

The FIT Project Manager will discuss project status on a weekly basis with the EPA Remedial Project Manager. Through these discussions, as well as the monthly progress and financial management reports, exchange of site information will be facilitated, and the scope of work can be reviewed and modified if necessary to maintain the desired focus.

## 4.3 Procurement

Procurement planning will be under the direction of the ZPMO Contracting Officer. The ZPMO Contracting Officer will be made aware of subcontracting needs through the FIT Project Manager.

Competitive bids will be solicited from small disadvantaged firms. The FIT Project Manager will review the bids along with the FIT Subcontracting Coordinator and the FIT Technical Specialist, and recommend an acceptable subcontractor. The EPA Contracting Officer will review the FIT subcontractor recommendation and give final approval prior to award of the subcontract. Subcontractor quality assurance and health and safety will be a FIT responsibility.

## 4.4 Change Orders

The monthly Work Assignment Status Report and Financial Management Summary Report will identify any unusual problems that may be upcoming in the project.

If forecasts predict that the work assignment budget or scope will change, written approval of the EPA Contracting Officer must be obtained. A written request for change submitted by FIT will initiate this process.

## 4.5 Work Plan Modifications

Prior to initiating additional work or major changes to the scope, the FIT Project Manager will prepare written documentation explaining the reasons for modifications. This documentation will include an estimate of man-hours and costs involved. No additional work will be performed until written authorization is received from EPA.

## 4.6 Quality Assurance

The quality assurance program to be applied to this project is a comprehensive program based on the quality assurance philosophy adopted by NUS when it was founded. The NUS President and Chief Executive Officer has promulgated a Corporate Quality Assurance Policy Statement that identifies the philosophy. This policy statement is the basis for the NUS Corporate Quality Assurance Policy Manual and for other manuals that direct each operating unit in the implementation of the quality assurance policy. Quality assurance is applied, as required, to all NUS projects.

Site-specific quality assurance requirements for the Lees Lane Landfill Site RI/FS, as developed in Task 7, will be based on the NUS Superfund Division Quality Assurance Manual, Issue B, dated October 30, 1983. All sample collection, sample preservation, and chain-of-custody procedures used during this investigation will be in accordance with the standard operating procedures as specified in the Water Surveillance Branch Standard Operating Procedures and Quality Assurance Manual (Draft), EPA, Region IV, ESD, as revised by the December 14, 1983 letter from the FIT Region IV Sampling Section Leader to the NUS Manager of Quality Assurance and Security; or as specified by the existing United States Environmental Protection Agency standard procedures and protocols for the contract analytical laboratory program.

# 5.0 COST AND SCHEDULE

## 5.1 Project Schedule

The schedule for the Lees Lane Landfill Site RI/FS is shown in Figure 5-1. The schedule indicates that approximately 15 months (60 weeks) are required to complete the total RI/FS.

Completion of the work on schedule is contingent on a 90-day turnaround of analytical results from the laboratories participating in EPA's CLP. This turnaround time includes completion of data validation by EPA's Environmental Services Division. The schedule also is contingent on securing a qualified drilling subcontractor within a reasonable timeframe. In addition, EPA review time for draft and final reports must be no more than that shown on the schedule to allow for completion of the RI/FS within the designated time period.

## 5.2 Cost and Budget

The total estimated cost for performance of the RI/FS is $558,778. The necessity to use higher levels of personnel protection than those anticipated during preparation of this Work Plan may result in a substantial increase in the cost of the RI. The RI/FS cost estimate of $558,778 does not include laboratory analytical costs. It is assumed that all laboratory work will be done by the EPA's CLP. The budget proposed herein is, therefore, independent of and in addition to, laboratory costs.

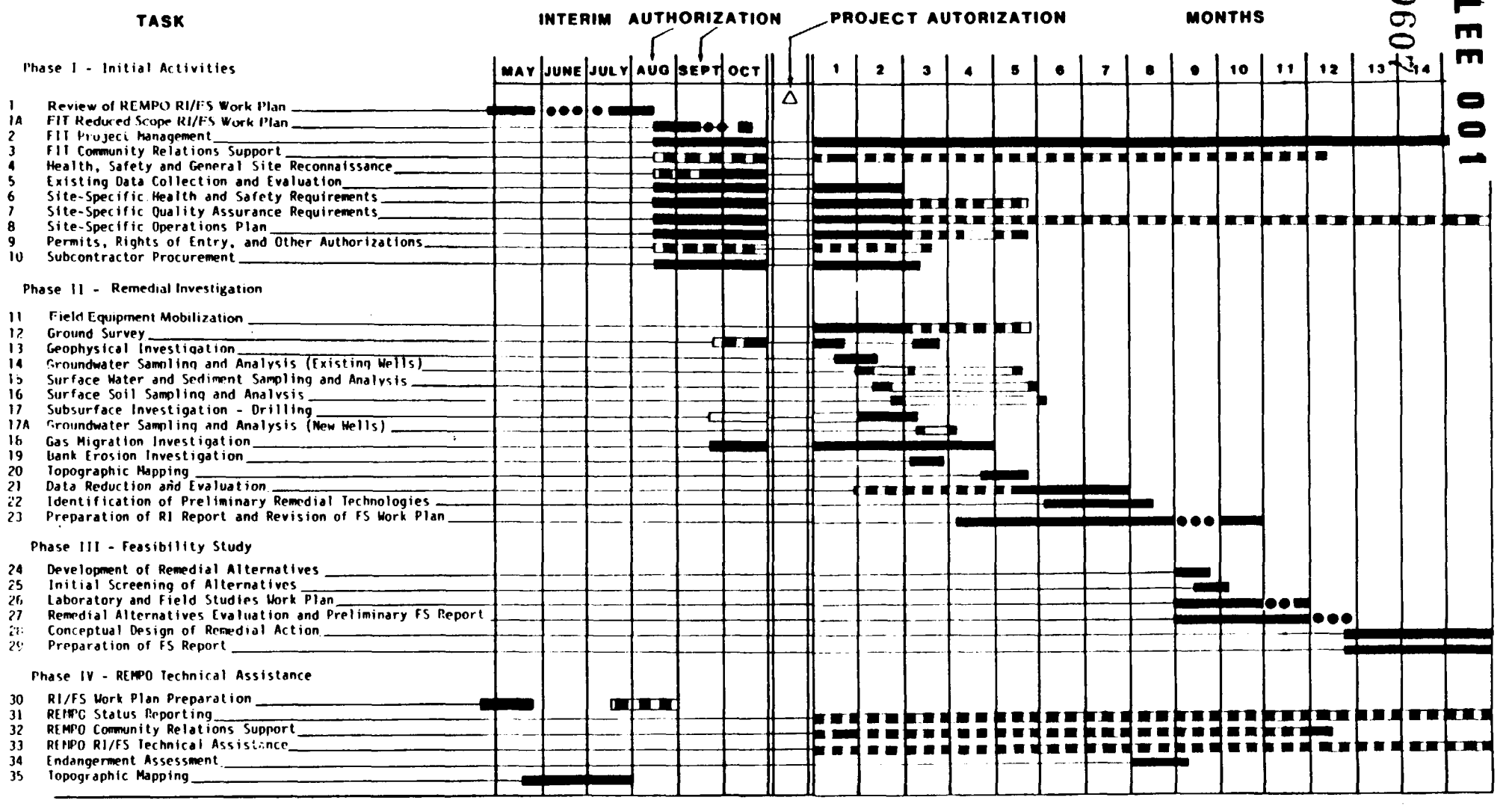
Phase I, Initial Activities will require a total of 3,130 man-hours. The RI (Phase II) and the FS (Phase III) will require 4,510 and 2,880 hours, respectively. REMPO Technical Assistance will require a total of 3,062 man-hours, making a total of 13,582 man-hours for the entire study. Manpower estimates for the major project phases and the tasks are provided in Table 5-1. Subcontractor manpower estimates are not included in the estimates shown in Table 5-1.

**TABLE 5-1**
**FIT MANPOWER PROJECTIONS**
**REMEDIAL INVESTIGATION/FEASIBILITY STUDY**
**LEES LANE LANDFILL SITE**

| Phase I - Initial Activities | Man-hours |
|---|---|
| Task 1 - Review of REMPO RI/FS Work Plan | 708 |
| Task 1A - Preparation of Reduced Scope RI/FS Work Plan | 500 |
| Task 2 - Project Management | 892 |
| Task 3 - FIT Community Relations Support | 100 |
| Task 4 - Health, Safety and General Site Reconnaissance | 150 |
| Task 5 - Existing Data Collection and Evaluation | 350 |
| Task 6 - Site-Specific Health and Safety Requirements | 100 |
| Task 7 - Site-Specific Quality Assurance Requirements | 50 |
| Task 8 - Site-Specific Operations Plan | 100 |
| Task 9 - Permits, Rights of Entry, and Other Authorizations | 30 |
| Task 10 - Subcontractor Procurement | 150 |
| **PHASE I SUBTOTAL** | **3,130** |
| Phase II - Remedial Investigation | |
| Task 11 - Field Equipment Mobilization | 180 |
| Task 12 - Ground Survey | 150 |
| Task 13 - Geophysical Investigation | 250 |
| Task 14 - Groundwater Sampling and Analysis (Existing Wells) | 180 |
| Task 15 - Surface Water and Sediment Sampling and Analysis | 400 |
| Task 16 - Surface Soil Sampling and Analysis | 125 |
| Task 17 - Subsurface Investigation - Drilling | 900 |
| Task 17A - Groundwater Sampling and Analysis (New Wells) | 300 |
| Task 18 - Gas Migration Investigation | 160 |
| Task 19 - Bank Erosion Investigation | 120 |
| Task 20 - Topographic Mapping | 375 |
| Task 21 - Data Reduction and Evaluation | 650 |
| Task 22 - Identification of Preliminary Remedial Technologies | 120 |
| Task 23 - Preparation of RI Report and Revision of FS Work Plan | 600 |
| **PHASE II SUBTOTAL** | **4,510** |

**MANPOWER PROJECTIONS**
**PAGE TWO**

| | Man-hours |
|---|---|
| Phase III - Feasibility Study | |
| Task 24 - Development of Remedial Alternatives | 525 |
| Task 25 - Initial Screening of Alternatives | 475 |
| Task 26 - Laboratory and Field Studies Work Plan | 200 |
| Task 27 - Remedial Alternatives Evaluation and Preliminary FS Report | 680 |
| Task 28 - Conceptual Design of Remedial Action | 650 |
| Task 29 - Preparation of Final FS Report | 350 |
| **PHASE III SUBTOTAL** | **2,880** |
| Phase IV - REMPO Technical Assistance | |
| Task 30 - RI/FS Work Plan Preparation | 1,662 |
| Task 31 - REMPO Status Reporting | 200 |
| Task 32 - REMPO Community Relations Support | 400 |
| Task 33 - REMPO RI/FS Technical Assistance | 500 |
| Task 34 - Endangerment Assessment | 240 |
| Task 35 - Topographic Mapping | 60 |
| **PHASE IV SUBTOTAL** | **3,062** |
| **FIT/REMPO PROJECT TOTAL** | **13,582** |






# RI/FS SCHEDULE
# LEES LANE LANDFILL SITE
# LOUISVILLE, KENTUCKY

**LEGEND**

- ACTIVITY
- INTERMITTENT ACTIVITY
- REDUCED ACTIVITY LEVEL (AWAITING DATA)
- ● ● ● EPA REVIEW

**FIGURE 5-1**

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Results of the RI may increase the scope of the FS, resulting in possible increases in required manpower and funds. A separate Work Plan for any treatability studies and/or additional field studies will be submitted to the EPA for approval, should the studies prove necessary in order to adequately evaluate the potential remedial actions.

## 6.0 REFERENCES

(1) NUS Corporation. September, 1984. Sampling Investigation Report, Lees Lane Landfill. TDD No. F4-8403-10.

(2) Bell, E.A. 1966. Summary of Hydrologic Conditions of the Louisville Area Kentucky. USGS Water Supply Paper 1819-C. 36p.

(3) Price, W.E. Jr. 1964. Geology and Hydrology of Alluvial Deposit along the Ohio River between Southwestern Louisville and West Point, Kentucky. USGS Hydrologic Investigation Atlas HA-111.

(4) Riverport Environmental Impact Report, Draft. 1980. Louisville and Jefferson County Riverport Authority, Louisville, Kentucky. Prepared by Stanley Consultants, Inc. Indianapolis, Indiana.

(5) Mill Creek Environmental Impact Statement, Jefferson County, Kentucky. 1980. Groundwater Program Task Report, Draft. U.S. EPA, Region IV, Atlanta, Georgia.

(8) Ecology and Environment, Inc. Feb. 1981. Emergency Action Plan on Lees Lane Landfill. TDD No. F4-8012-08.

(9) Zimmerman, W.H. 1966. Soil Survey of Jefferson County, Kentucky. U.S. Department of Agriculture, Soil Conservation Services, Series 1962, No. 11, 37p.